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THE MORPHOLOGY OF SOME NEW CULICINE LARVAE FROM THE SOUTHERN CAMEROONS, WITH NOTES ON *CULEX* (*CULEX*) *INGRAMI* EDWARDS AND *CULEX* (*CULEX*) *TOROENSIS* EDWARDS

By M. W. Service

(*Malaria Service, Federal Medical Department, Yaba-Lagos, Nigeria*)

A series of interesting Culicine larvae were collected in the course of field surveys carried out in the Southern Cameroons during 1957. Some of these can be identified as morphological variations of already existing species, while others are rather more interesting to a systematist and are described here as representing new species. No name has been given to them, as no corresponding adults are known, and they are treated as " sp. indet". The specimens are of considerable interest as their closest relatives are of East African distribution e.g. *C. toroensis*, *C. laticinctus* and *C. subrima*.

Culex (*Culex*) *ingrami* Edwards

Three fourth instar larvae of *ingrami* were found breeding in a forest pool at Tinto (situated about 25 miles from the town of Mamfe). They differ from the British Museum type forms and from the " Kampala " forms in the arrangement of the spines on the siphon and also in the subventral tufts. Typical specimens of *ingrami* have a siphonal index of 14, 12 paired spines in the pecten followed by 2–4 unpaired simple spines, and a group of 4–6 ventrolateral appressed spines near the tip of the siphon. Subventral tufts number 3 pairs and have 2–3 simple branches. Atypical " Kampala " forms have a shorter siphon (index of 8–10), and a pecten of about 25 paired spines which, towards the apex, alternate with simple spines and finally at the apex merge into a group of appressed siphonal spines.

The larvae found in the Cameroons have a much shorter siphon (index of about 5), a pecten of about 13 paired barbed spines, followed by an alternating group of about 7 paired and single simple spines. These finally merge into the apical group of 2–3 simple spines. Subventral tufts number 4–5 pairs, longer than the siphon with 3–5 simple branches (fig. 1).

The British Museum also has a specimen from Liberia, collected by Dr. W. Peters, which appears to be intermediate in morphological structure between the " Kampala " forms and those from the Cameroons. It has a siphonal index of 8, a pecten of 15 paired barbed spines, followed by 9 paired and single, simple spines, reaching to the tip of the siphon. The subventral tufts are longer than those of described material, but do not appear to be quite as long as those of the Cameroons specimens.

Culex (*Culex*) *toroensis* Edwards

Six fourth instar larvae were found, three in a rock pool at Besongabang (situated about 3 miles from Mamfe Town), the other three at Banso in a muddy pool. All six are undoubtedly *C. t. toroensis* but the variation of their pecten

spines and apical group on the siphon is of interest. Below is a brief description of the larvae.

The three specimens from Besongabang.—Pecten of 13–14 paired spines, proximal ones with 3–5 basal denticles, distal with the same number or less, the latter 1 or 2 spines may be

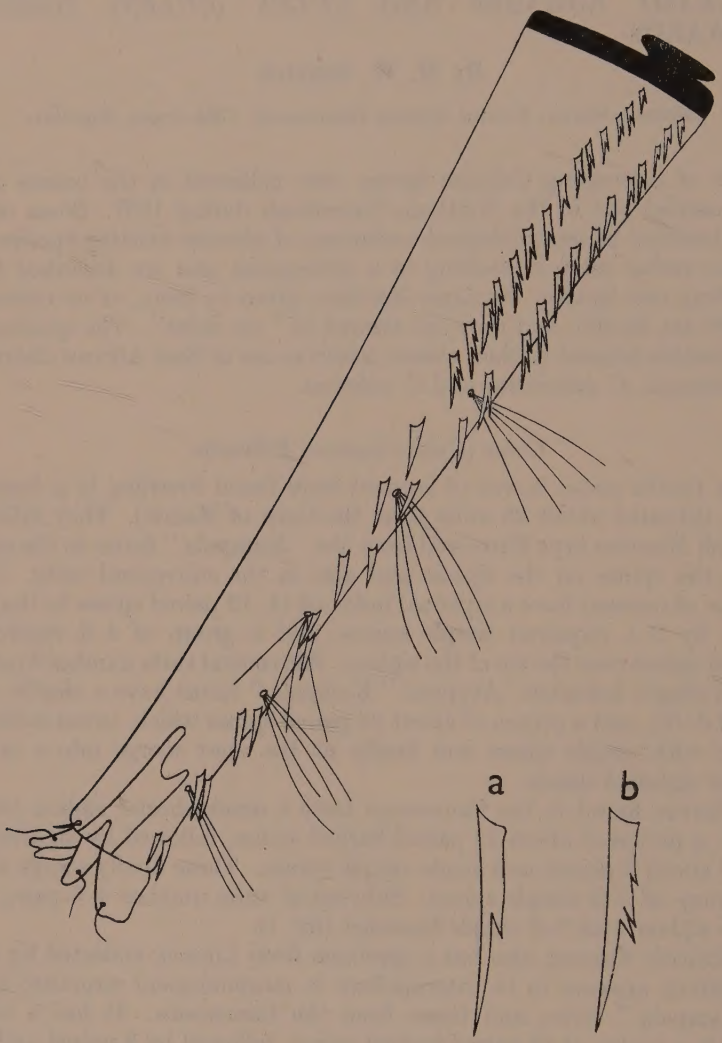

FIG. 1.—Siphon of *Culex* (*Culex*) *ingrami* Edwards, showing (*a*) distal and (*b*) proximal pecten spines.

simple and unpaired or all may be paired; 3 pairs of subventral tufts, simple and bifid. Apex of siphon with a group or 5, 1 or no dorsal spines; no ventral spines.

The three specimens from Banso.—Pecten of 12–14 paired spines, proximal ones with 2–5 basal denticles, distal spines may all be simple and unpaired, or with fewer denticles becoming simple; a more widely spaced unpaired simple spine may or may not be present;

2 or 3 pairs of subventral tufts, simple and bifid. Apex of siphon with a group of 2 or 4 simple spines ; no ventral spines.

Specimens of *toroensis* in the British Museum from the Sudan and Kenya are typical in that they all (six specimens were examined) possess both ventral and dorsal spines at the apex. None of them showed the arrangement depicted by Hopkins (1952), with a large group of about 13 dorsal spines. The specimens examined had 1–3 ventral spines and 2–9 dorsal spines at the siphonal apex. Other specimens in the Museum, from the same locality, had either no spines at the apex or 1–2 dorsal spines only. Dr. D. J. Lewis presented the Museum with a specimen from the Sudan having neither dorsal nor ventral spines, but only a simple single spine mid-way between the end of the pecten and the siphon.

It would appear from the above account that *C. toroensis* is capable of exhibiting a great degree of variation in the spines of the siphon, and that the prominent appressed spines near its apex do not form reliable characters for the identification of this species. Its distribution is also possibly wider than previously thought, as its presence in the Cameroons has not previously been recorded.

Culex (*Culex*) sp. indet.

The British Museum has several larval specimens of *C. laticinctus* Edwards collected from Aden, Saudi Arabia, Eritrea, Yemen, Palestine and Greece. None of these show any morphological variations from the type form. Two larvae were found in a rock pool at Besongabang in the Cameroons and are identified from Hopkins' (1952) key as *C. laticinctus*. However, although these larvae resemble *laticinctus* morphologically, they are sufficiently different to be placed as either a new subspecies or a new species. Similar small differences are recorded as being of value for separating species of the *pipiens* group to which the above belong. The larvae are therefore described as if they represented a new species or subspecies, but as no adults are available no name is given to them.

Head.—Antennae strongly spiculate, basal portion with small brown patch, portion distal to tuft infuscate, tuft of about 30 plumose branches at two-thirds. Setae *A*, *B* and *C* all plumose ; *A* with 8 branches, *B* with 2 branches and *C* with 2 branches ; seta *d* with 4–5 short simple branches. Mentum with 5 teeth on each side of a central tooth (fig. 2).

Abdomen.—Comb a patch of 35 scales. Siphon concave dorsally but appearing straight ventrally, index about 4–5 ; pecten extending to one-third, composed of 11 straight paired spines with 1–3 basal denticles, distal spines not appreciably more widely spaced. Subventral tufts 5, placed close to mid-ventral line and as long as diameter of siphon at point of attachment, each composed of 7–8 subplumose branches ; a small tuft of 4 simple branches in a more lateral position near apex of siphon ; no subdorsal tufts. Anal segment ; distal edge of saddle smooth, broader than long (ratio 3 : 2) ; upper caudal seta with 3 branches, lower caudal seta single, lateral seta small and bifid. Ventral brush composed of about 6 pairs of many-branched tufts. Gills damaged, but appearing lanceolate and longer than saddle.

The chief differences between the above specimens and *laticinctus* are as follows :

Antennae with 30 plumose branches, *laticinctus* 35–40 ; setae *A* with 8 branches and *B* and *C* both with 2 branches, *laticinctus* setae *A* with about 10

branches, *B* and *C* both with 4 branches (*C* may have 3 or even 5 branches); *d* 4–5, *laticinctus d* single; pecten spines straight, *laticinctus* slightly curved; saddle broader than long, *laticinctus* longer than broad; upper caudal seta 3, *laticinctus* upper caudal seta 4 (Kirkpatrick records specimens with 5–6 branches); lower caudal seta single in both cases.

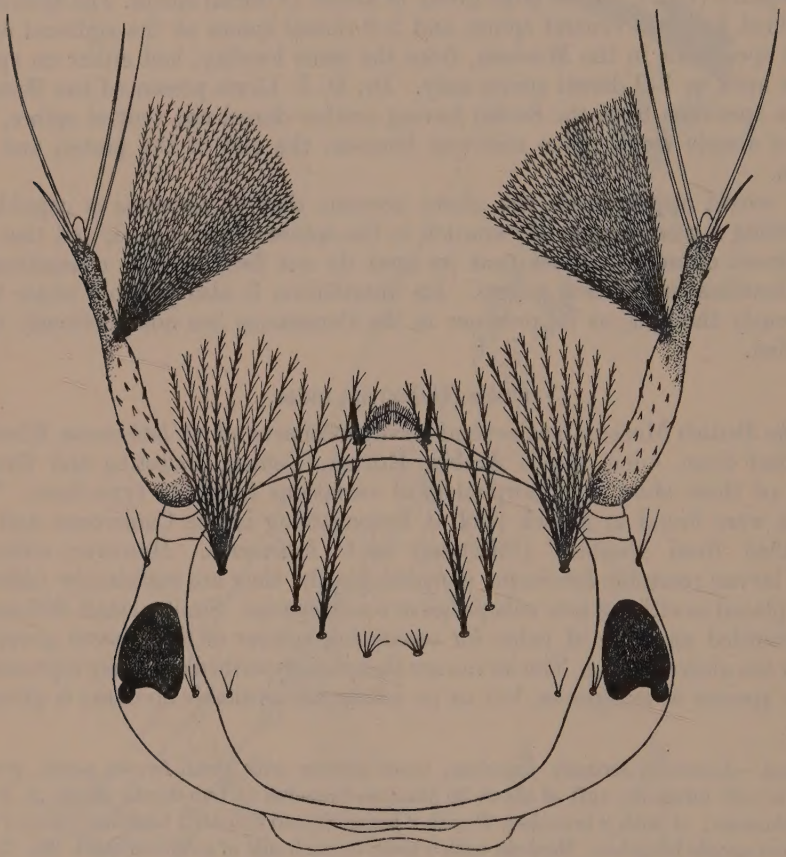

Fig. 2.—Head of larva of *Culex* (*Culex*) sp. indet. (near *laticinctus*).

Culex (*Neoculex*) sp. indet.

Two damaged larval pelts together with a fourth instar larva were collected from a marsh near Bamenda town. They are identified with the aid of Hopkins (1952) as *C. subrima* Edwards, but on a more detailed examination they differ sufficiently to justify being placed as a separate species, unnamed in the absence of any adult specimens. Below is a description based on the two larval pelts and the fourth instar larvae.

Head.—Antennae pale, spiculate, tufts of about 15 plumose branches at three-fourths. Setae *A*, *B* and *C* plumose, *A* with 8–9 branches, *B* and *C* both with 3 branches, about two-thirds length of head; *d* long and simple; *e* with 5–6 branches. Mentum with about

10 teeth on each side of central tooth, shape of mentum differs greatly from that of *subrima* and *rubinotus* (fig. 3).

Abdomen.—Comb a patch of 35–40 long narrow scales, distal ones tending to be larger than proximal. Siphon long and pale in colour, with both sides converging to apex, index 6–7 ; pecten of 8–10 paired spines, more closely set than in *rubinotus*, extending to nearly

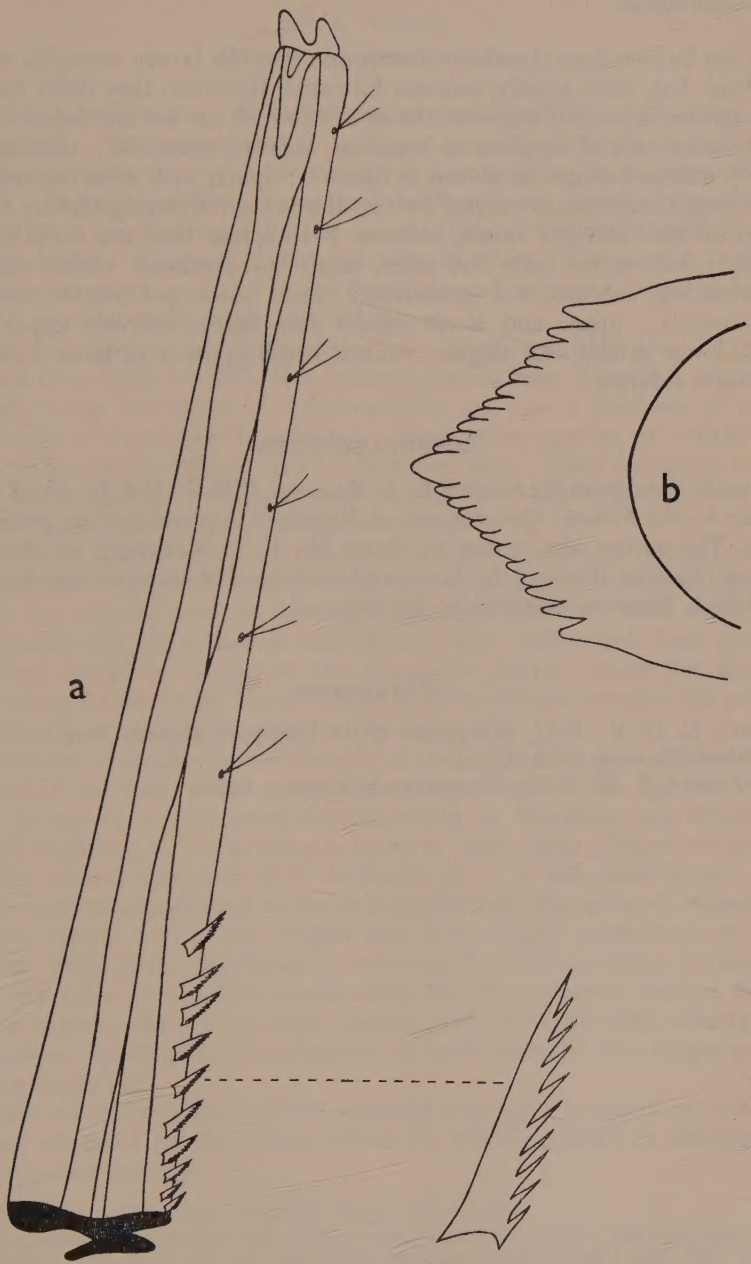

FIG. 3.—(*a*) Siphon and (*b*) mentum of *Culex* (*Neoculex*) sp. indet. (near *subrima*).

one-fourth length of siphon, each spine with numerous (about 10) fine denticles all along ventral side ; subventral tufts 5–6 pairs each with 2–3 branches, small but distinctly visible under low magnification. Anal segment with complete saddle, distal edge smooth, upper and lower caudal seta single, lateral seta 4–6 branches. Ventral brush appears to be of 5 pairs of many branched tufts, longer than saddle. Dorsal pair of gills twice length of saddle, ventral pair shorter.

It can be seen from the above description that the larvae resemble *rubinotus* Theobald, but, more closely, *subrima* Edwards. However, they differ from both these species in several respects, the chief of which are set out below :

Antennal tuft of 15 plumose branches, *subrima* about 30 ; mentum of an entirely different shape, as shown in figure 3 ; siphon with sides converging for entire length, *subrima* converging for two-thirds then diverging slightly to apex ; pecten of 8–10 straight spines, *subrima* 8–10 spines that are slightly arched dorsally ; subventral tufts 5–6 pairs, small but distinctly visible under low magnification, *subrima* 2–3 exceedingly small pairs, not visible under low magnification ; upper and lower caudal seta single, *subrima* upper caudal seta 3, lower caudal seta single ; ventral brush appears to have 5 tufts and not 6 as in *subrima.*

Acknowledgments

Thanks are due to Sir Samuel L. A. Manuwa, C.M.G., O.B.E., Chief Medical Adviser to the Federal Government of Nigeria, for permission to publish this paper. The author also wishes to thank Mr. P. F. Mattingly, of the British Museum (Natural History), for his valuable advice and help and also for putting the British Museum material at his disposal.

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Kirkpatrick, T. W., 1925, *Mosquitoes of Egypt.* Cairo.

THE GENUS *CYBOCEPHALUS* ERICHSON IN THE MASCARENE ISLANDS (COLEOPTERA : NITIDULIDAE)

By J. Vinson

(*Director, Mauritius Institute*)

Cybocephalus beetles are well-known predators of scale-insects in many parts of the world. Their small size (1 to 2 mm.), compact shape, and retracted appendages render the verbal definition of their specific characters extremely difficult. Descriptions not accompanied by figures are practically useless and identifications not confirmed by the examination of the male genitalia leave room for doubt. Special attention has therefore been given to this apparatus in the present paper, and also to the front legs and antennae, which have been found to provide useful diagnostic characters.

Only one species of *Cybocephalus*, *C. semiflavus* Champion, originally described from India in 1925, was hitherto known from Mauritius, where it is recorded, under the name of "*Cybocephalus* sp.", as a predator of certain scale-insects of economic importance. Nine other species, of which eight appear to be new to science, will be discussed here. Their biology is not yet known in detail, but it is most probable that they also help to prevent outbreaks of scale-insects in the islands concerned.

In view of the fact that less than one hundred species of *Cybocephalus* are at present known from the whole world, it is surprising that at least one-tenth of them are concentrated on the tiny Mascarene Islands. This must surely only indicate that these obscure and difficult little beetles have been generally overlooked elsewhere, except in the Seychelles Islands where the thorough investigations of Dr. Hugh Scott, F.R.S., in 1908–09 have revealed the presence of not less than five species described by Grouvelle[1].

A student of insular faunas should, of course, make a point of noting the condition of the hind wings in the Coleoptera. One of the species, *Cybocephalus decaeni* sp. n., occurring simultaneously in Mauritius and Réunion, is definitely flightless, its wings being reduced to short linear ciliated vestiges (fig. 28). The unique specimen of *C. hughscotti* sp. n. is also short-winged. The position is more complicated in another species from Mauritius, *C. mauritiensis* sp. n., in which both fully winged and short-winged forms seem to occur. Similarly, while in the Seychelles *C. minimus* Grouvelle possesses normal hind wings, examples of the same species from Mauritius show a marked atrophy of these organs. In all the other species dealt with no wing reduction has been noticed, but further investigation on fresh material and longer series is certainly desirable[2].

Unless otherwise stated, all the material forming the subject of this paper has been collected by the writer, either by beating shrubs or sweeping low vegetation and herbage.

[1] 1913, *Trans. Linn. Soc. Lond.* (2) (Zool.) **16** : 110–116.

[2] Wing atrophy in certain *Cybocephalus* species of North Africa has been recorded by Peyerhimoff (1927, *Bull. Soc. ent. Fr.* **1927** : 239) and by Normand (1940, *Bull. Soc. ent. Fr.* **45** : 53).

With the exception of the type of *Cybocephalus bourbonnensis* sp. n., collected by the Franco-Mauritian Expedition of 1955, which will be deposited in the Muséum National d'Histoire Naturelle, Paris, the repository of the types of other new species will be the British Museum (Natural History).

In almost every case the parts figured in the text are from the types to which the relevant balsam microscopical preparations have been attached.

Cybocephalus Erichson

Erichson, 1844, in *Z. Ent.* (Germar) **5** : 441.

Type of genus : *Anisotoma ruficeps* Sahlberg, 1834, *Ins. Fenn.* **1** : 472.

Key to the Species of *Cybocephalus* from the Mascarene Islands

1 Dorsal surface alutaceous, microsculpture visible at ×50 8
– Dorsal surface not alutaceous 2
2 Puncturation of elytra extremely fine and just visible at ×50 . . . 3
– Puncturation of elytra much stronger, perceptible at ×12 and quite distinct at ×50 5
3 Front tibiae dilated towards apex 4
– Front tibiae not dilated towards apex . . . . . **bourbonnensis** sp. n.
4 Size comparatively large (1·8 mm.) ; front legs with tibiae triangular and first tarsal segments as long as the others combined **nesogallicus** sp. n.
– Size smaller (1·2 to 1·4 mm.) ; front legs with tibiae broadly rounded near apex and first tarsal segment shorter than the others combined **cirnensis** sp. n.
5 Puncturation of elytra composite, with simple punctures on the basal half and 3-shaped ones on the apical half ; sexes dimorphic in colour, male with yellow head and pronotum, female all dark **semiflavus** Champion
– Puncturation of elytra simple ; sexes similar in colour 6
6 Front tibiae triangular, with pre-apical angle armed with a strong and short tooth-like seta 7
– Front tibiae not triangular, only slightly dilated towards apex and unarmed . . . . . **rodriguezensis** sp. n.
7 Head, or at least apical margin of pronotum, metallic bluish-green ; shape elongate-ovate . . . . . **minimus** Grouvelle
– Head or apical margin of pronotum not metallic ; shape more shortly ovate . . . . . **mauritiensis** sp. n.
8 Size large (1·5 to 1·6 mm.) ; microsculpture of dorsal surface uniform on elytra and pronotum . . . . . **robertscotti** sp. n.
– Size smaller (1·0 mm.) ; microsculpture of dorsal surface variable in intensity 9
9 Colour slightly but distinctly dark metallic green ; microsculpture sometimes very faint but always visible at least on pronotum **decaeni** sp. n.
– Colour black, not metallic ; microsculpture uniform and quite distinct on elytra, indistinct on pronotum . . . . . **hughscotti** sp .n.

Cybocephalus bourbonnensis sp. n.

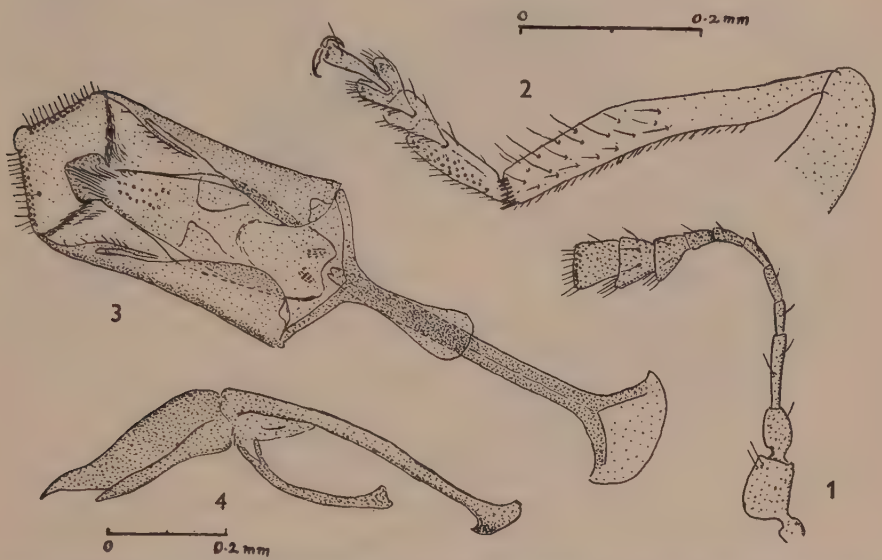
Length 1·05 to 1·30 mm.

Brownish-black, shining, extremely finely and sparsely punctate, the punctures being only just visible at ×50 ; ovate, constricted behind and very convex. Metasternum

bearing a few short yellowish hairs; supra-coxal triangular depression to receive hind femur at rest deep, shining, except on external side which is narrowly alutaceous. Antennae (fig. 1) testaceous, thin, with third segment longer than fourth and fifth combined, eleventh truncate at apex. Legs testaceous; front tibiae (fig. 2) thin, not dilated towards apex, somewhat arcuate, with a few fine hairs on the apical half; first tarsal segment elongate, feebly bilobed, about one-third length of tibia and only a little shorter than the remaining segments combined; hind femora moderately swollen.

Male.—Head obscure yellow; pronotum brownish-black at base and on sides, reddish-yellow in apical region. Aedeagus (figs. 3, 4) comparatively short, strongly sclerotized; internal sac not seen.

Female.—Head and pronotum concolorous, reddish-brown.



FIGS. 1–4.—*Cybocephalus bourbonnensis* sp. n. (1) Antenna; (2) front leg; (3) aedeagus, underside view; (4) aedeagus in profile.

Holotype ♂, RÉUNION: Pic Bébour, 26.i.1955 (*Mission franco-mauritienne*). Paratype ♀♀, Saint Denis (Jardin Colonial), 26.x.1937, 2 ex.; Côte Sud-Est, 29.x.1937, 1 ex.

This species seems to be quite isolated from the other species of the Mascarenes, at least in the peculiar structure of the male genitalia.

Cybocephalus nesogallicus sp. n.

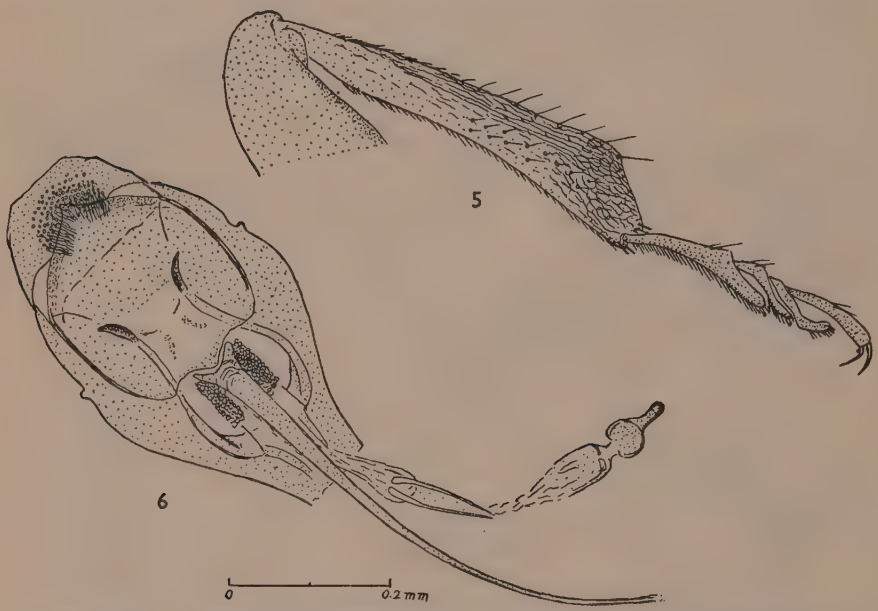
Length 1·8 mm.

Male.—Brownish-black, moderately shining, finely and sparsely punctate, punctures visible only at ×50; broadly ovate. Metasternum with supra-coxal triangular depression comparatively deep and shining. Antennae testaceous (not dissected). Legs yellow, with femora infuscated; front tibiae (fig. 5) compressed laterally, triangular, dilated towards apex on upper edge, where a few fine hairs are present, surface striolate longi-

tudinally, tarsus elongate, two-thirds length of tibia, with first segment very long, as long as remaining segments combined, first to third strongly bilobed; hind femora swollen, tibiae very thin and weak. Aedeagus (fig. 6) feebly sclerotized, tegmen truncate, apex of invaginated internal sac teat-shaped. Hind wings fully developed.

Holotype ♂, Mauritius: Mt. Corps-de-Garde, 2.xii.1934.

The largest species of the Mascarenes. The name is a translation of " Isle de France ", which designated Mauritius during the French occupation of the island.



Figs. 5, 6.—*Cybocephalus nesogallicus* sp. n. (5) Front leg; (6) aedeagus.

Cybocephalus cirnensis sp. n.

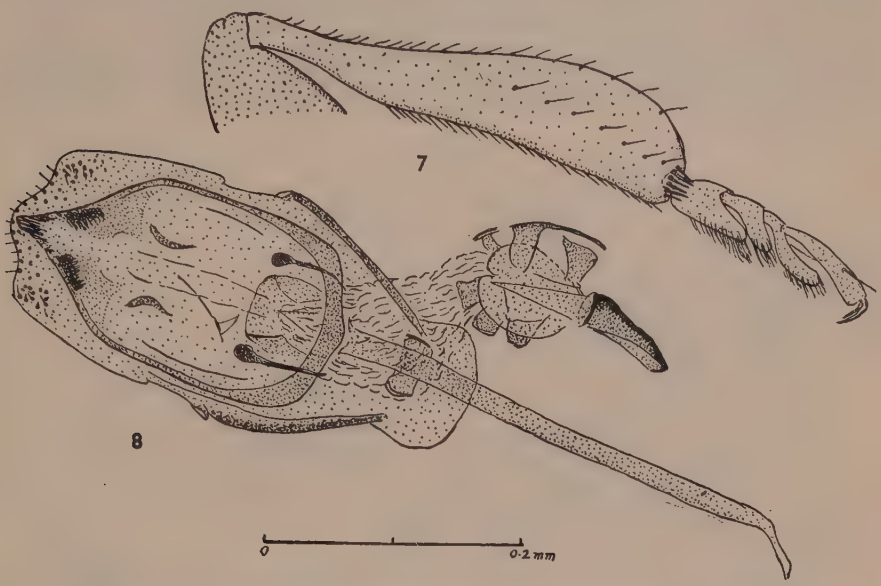
Length 1·2 to 1·4 mm.

Black, very shining, with a slight bluish metallic sheen, head and front margin of pronotum slightly but distinctly aureous; very finely and sparsely punctate, punctures just visible at ×50; oval-elongate and rather depressed. Metasternum lightly clothed with long golden hairs through which a fairly strong puncturation is visible; supra-coxal triangular depression smooth and very shining. Antennae testaceous (not dissected). Legs yellow; front tibiae (fig. 7) compressed laterally and broadly dilated towards apex on upper edge and broadly rounded, this edge bearing a few short fine hairs; tarsus short, about half length of tibia, with first segment bi-lobed, half length of remaining segments combined, second and third strongly bi-lobed. Hind wings fully developed.

Male.—Aedeagus (fig. 8) mainly characterized by the tri-lobed condition of the tegmen; sclerotized parts of the internal sac of indefinite shape.

Holotype ♂, Mauritius : Mt. Pouce, 2.xi.1938. Paratypes, same locality, 2.xi.1936, 2.xi.1938 and 24.xii.1942, 3 ex.

This species is named in allusion to the early Portuguese name of Mauritius, " Ilha do Cirne ".



Figs. 7, 8.—*Cybocephalus cirnensis* sp. n. (7) Front leg ; (8) aedeagus.

Cybocephalus semiflavus Champion.

Champion, 1925, *Ent. mon. Mag.* 61 : 263. (type Northern India, Kumaon district, British Museum).

Length 0·95 to 1·15 mm.

Male.—Head and pronotum yellow, lightly punctured ; elytra black, very finely punctured on the basal half, much more strongly on the apical half, where the punctures are roughly 3-shaped with a short hair in the middle (fig. 11) ; these punctures are perceptible at ×12 and stop just before the apical region, which is translucent. Pronotum feebly alutaceous, at least on the sides. Antennae (fig. 9) yellow, with apical segment sub-truncate, third segment fairly elongate, as long as fourth and fifth combined. Legs (fig. 10) yellow ; front pair with tibia narrowly triangular but not emarginate on upper edge in the pre-apical region and bearing short fine hairs ; tarsus short, half length of tibia, with first segment half length of remaining segments together. Hind wings fully developed.

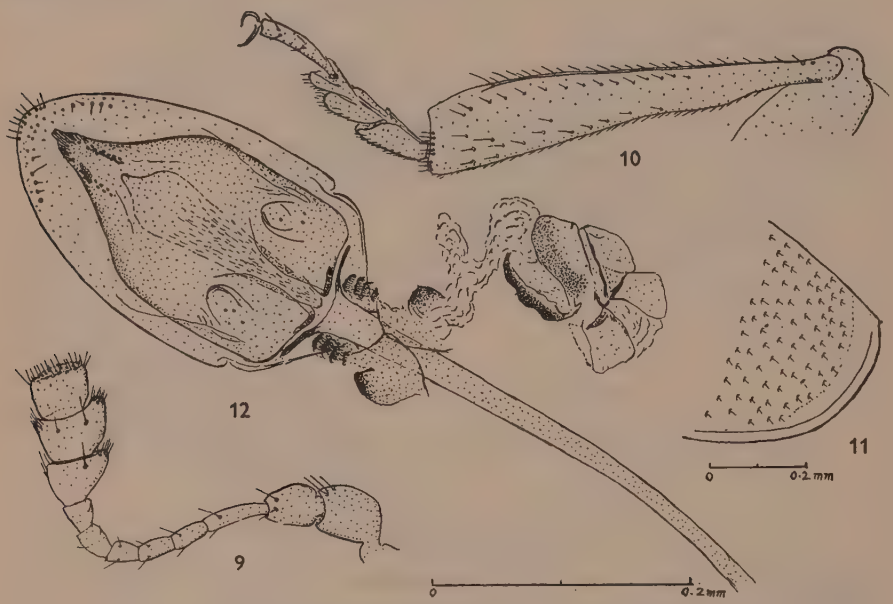
Aedeagus (fig. 12) with tegmen constricted towards apex, sclerotized parts of internal sac of indefinite shape.

Female.—Head and pronotum brownish-black instead of yellow, otherwise similar to male.

Mauritius : Pointe aux Sables, iv.1936, 4 ex. ; Souillac, 24.xii.1935, 2 ex. ; Mahébourg, 3.v.1936, 5 ex.

Réunion : Saint Denis, 26.x.1937, 1 ♂.

Originally described from Northern India, it is not known when and how this species reached the Mascarene Islands. In Mauritius it is recorded (under the name of *Cybocephalus* sp.) as a common predator of the Coconut scale, *Aspidiotus destructor* Signoret, and also of the Sugar-cane scale, *Aulacaspis tegalensis* Zehnt., of which, according to Moutia (1944, *Bull. ent. Res.* **35** : 75), it is " a very seasonal and limited predator ". In Réunion in 1937 the writer observed it attacking the Aleyrodid *Stenaleyrodes vinsoni* Takahashi on various palm trees. In India *C. semiflavus* has been found on *Diaspis* sp., *Chionaspis* sp. and *Aleyrodes* sp.



Figs. 9–12.—*Cybocephalus semiflavus* Champion. (9) Antenna ; (10) front leg ; (11) apical portion of elytron ; (12) aedeagus.

The specimens were identified by Dr. Hugh Scott, in 1938, who compared the Mauritius material with the type in the British Museum.

Cybocephalus rodriguezensis sp. n.

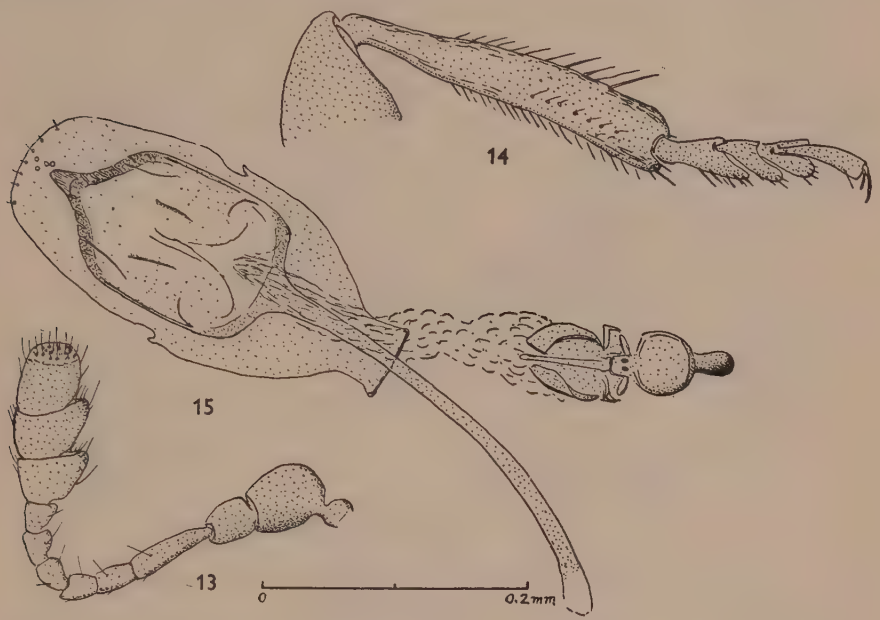
Length 0·90 to 1·15 mm.

Uniformly brownish-black, moderately shining, oval ; sparsely but strongly punctured, punctures visible at ×12 and distinctly coarser on sides of elytra near shoulders. Metasternum and abdomen sparsely clothed with whitish hairs ; supra-coxal triangular depression smooth and shining. Antennae (fig. 13) infuscated, stout, with third segment comparatively long, sub-equal to fourth, fifth and sixth combined. Legs infuscated ; front pair (fig. 14) with tibia only very slightly dilated towards apex but not emarginate, upper edge bearing a series of fairly long and strong setae, tarsus longer than half length of tibia and with first segment equal to second and third combined. Hind wings fully developed.

Male.—Aedeagus (fig. 15) characterized by the small number of pores on the apical region of the tegmen ; apical sclerotised portion of invaginated internal sac teat-shaped.

Holotype ♂, Rodriguez : viii–xi.1918 (*H. Snell* and *H. P. Thomasset*). Paratypes, same data, several ex.

This new species is allied to *C. mauritiensis* sp. n., from which it differs mainly in the shape of the front tibiae, which are not triangular, and in the coarser puncturation of the sides of the elytra. The aedeagus is the same pattern in the two species, but, as will be seen from the figures, there are obvious differences.



Figs. 13–15.—*Cybocephalus rodriguezensis* sp. n. (13) Antenna ; (14) front leg ; (15) aedeagus.

Cybocephalus minimus Grouvelle.

Length 1·05 to 1·12 mm[3].

Black, with head and front margin of pronotum more or less metallic bluish-green according to sex ; dorsal surface strongly punctured, punctures visible at ×12. Shape oval, with elytra almost parallel along two-thirds towards apex. Head with frons distinctly microsculptured in transversely elongate meshes ; antennae (fig. 16) brownish-black, with third segment comparatively short, shorter than fourth and fifth combined. Pronotum very faintly microsculptured on the sides. Elytra more or less narrowly microsculptured on pre-apical area, before margin. Legs dark ; front pair (fig. 17) with tibia broadly triangular, upper edge armed with a short and strong tooth-like seta, followed towards base by short fine hairs.

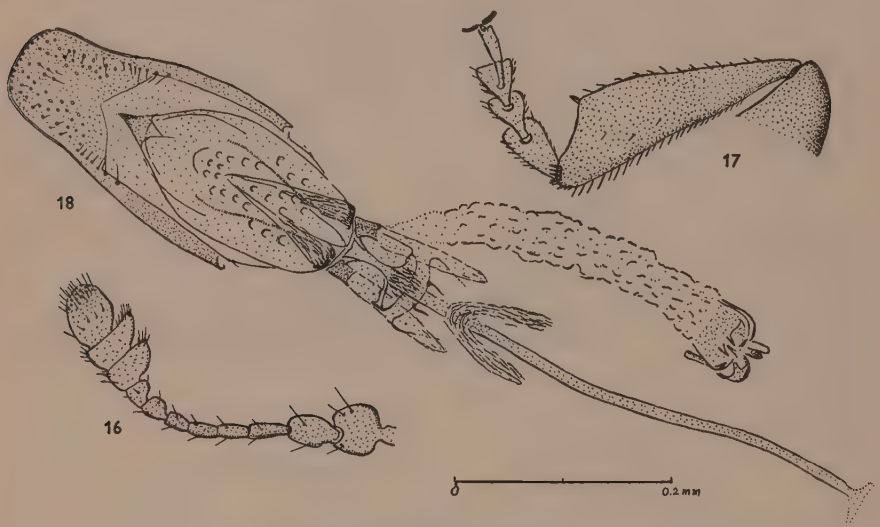
[3] A length of 0·6–0·9 mm. is given in the original description, but Grouvelle's measurements seem to be generally on the low side.

Male.—Head and front margin of pronotum metallic bluish-green. Aedeagus (fig. 18) narrowly elongate, with tegmen bluntly rounded at apex and strongly sclerotized ; internal sac with sclerotized apical parts of indefinite shape.

Female.—Head black, front margin of pronotum narrowly but very distinctly metallic bluish-green.

Mauritius : Roches Noires, ix.1936, 11 ex. ; Palmar, vii.1934, 2 ex. ; Réduit, 27.x.1936, 5 ex.

This species was collected by sweeping the grass *Stenotaphrum dimidiatum*. It was hitherto known only from the Seychelles and the identification of the Mauritius material has been made from comparison with Grouvelle's paratypes



Figs. 16–18.—*Cybocephalus minimus* Grouvelle. (16) Antenna ; (17) front leg ; (18) aedeagus.

which have been dissected for examination of the male genitalia. The above redescription and figures are based on Mauritian specimens. As noted in the introduction, the hind wings of this species are fully developed in the Seychelles but noticeably reduced (and probably unsuitable for flight) in Mauritius, which certainly deserves further investigation.

Cybocephalus mauritiensis sp. n.

Length 1·08 to 1·18 mm.

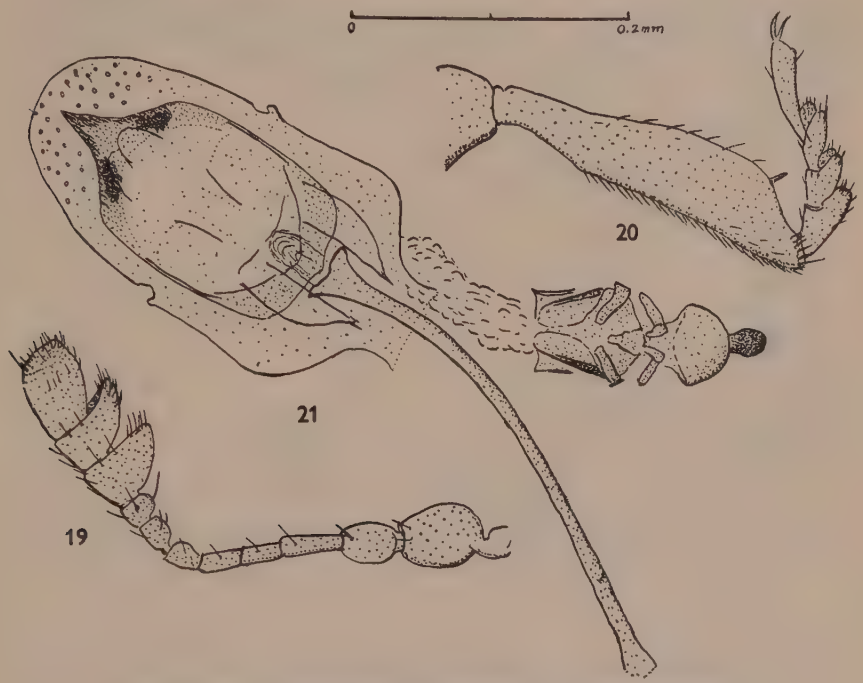
Black or brownish-black without any metallic sheen ; sparsely but strongly punctured, punctures perceptible at ×12 ; puncturation of pronotum distinctly finer than on elytra ; shape shortly oval, tapered behind, profile convex. Metasternum with supra-coxal triangular depression alutaceous. Antennae (fig. 19) infuscated, with third segment a little shorter than fourth and fifth combined. Legs infuscated ; front pair (fig. 20) with tibia broadly triangular, but angle of upper edge rounded, armed with a fairly strong and long

tooth-like seta, tarsal segments 1–3 broad and short, feebly bilobed. Hind wings fully developed (type).

Male.—Aedeagus (fig. 21) with tegmen rounded at apex and bearing a limited number of pores ; sclerotized extremity of invaginated internal sac teat-shaped.

Female.—Not distinguishable from male on external characters.

Holotype ♂, MAURITIUS : Belle Rive, 1.xii.1957. Allotype ♀ and paratype ♀, Mt. Pouce, 2.xi.1936 and 2.xi.1938, 2 ex. Paratypes, Belle Rive, 1.xii.1957, 3 ex. ; Mt. Pouce, 2.xi.1936 and 2.xi.1938, 4 ex. ; Forest Side, 12.i.1935, 3 ex.



FIGS. 19–21.—*Cybocephalus mauritiensis* sp. n. (19) Antenna ; (20) front leg ; (21) aedeagus.

This species seems to be related to *C. rodriguezensis* but the front tibiae, at least, are very different in the two species. The puncturation of the elytra appears to be variable in this species, some examples (not included in the paratypic series) being distinctly more finely punctured than others. Similarly, the condition of the hind wings is difficult to interpret as these organs are fully developed in some specimens and atrophied in others. Further investigation on fresh material appears necessary as two different species may, in fact, be involved.

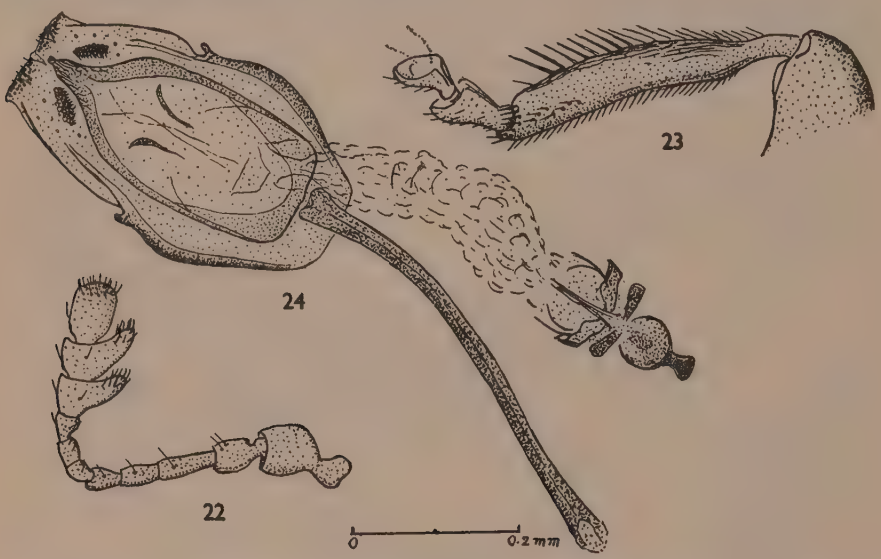
Cybocephalus robertscotti sp. n.

Length 1·5 to 1·6 mm.

Black, moderately shining, convex ; dorsal surface alutaceous throughout, meshes of microsculpture iso-diametric, small but uniform in intensity and quite distinct ; punctura-

tion fairly strong, perceptible at ×12, evenly spaced, a little finer on pronotum. Antennae (fig. 22) infuscated, with third segment a little shorter than fourth and fifth combined, ninth and tenth short, strongly produced on the internal side. Legs infuscated; front pair (fig. 23) not dilated towards apex, upper edge bearing a series of fairly long and stout setae. Hind wings fully developed.

Male.—Aedeagus (fig. 24) with apex of tegmen truncate and covered by numerous pores, two other clusters of pores on each side near extremity of median lobe, sclerotized apex of invaginated internal sac teat-shaped.



Figs. 22–24.—*Cybocephalus robertscotti* sp. n. (22) Antenna; (23) front leg; (24) aedeagus.

Holotype ♂, Mauritius: Mt. Pouce, 2.xi.1938. Allotype ♀, same locality, 2.xi.1936. Paratypes, same locality, 2.xi.1936 and 2.xi.1939, 2 ex.

This species approaches *C. nesogallicus* sp. n. in size, but is easily distinguished by the microsculpture of the dorsal surface, the conformation of the front tibiae and the structure of the male genitalia. It is named in honour of Sir Robert Scott, K.C.M.G., the present Governor of Mauritius.

Cybocephalus decaeni sp. n.

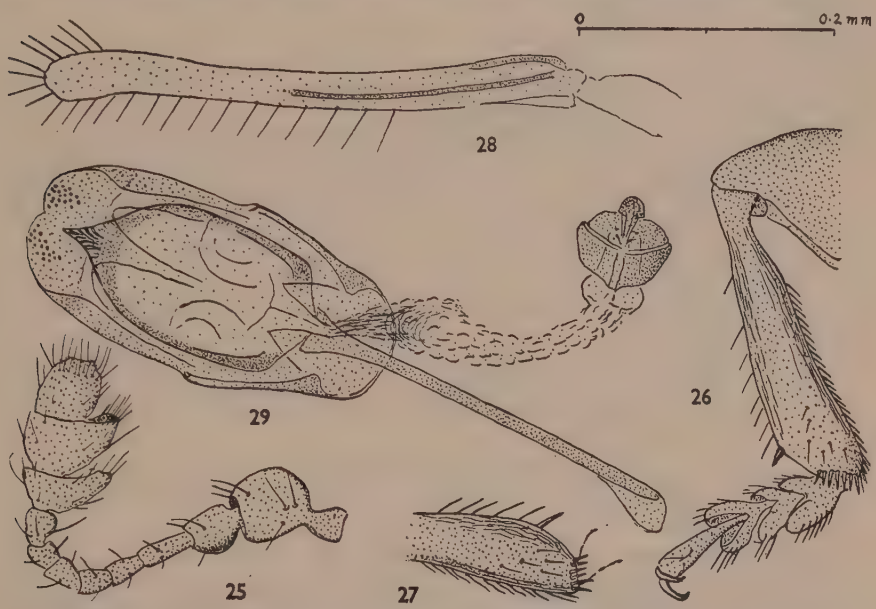
Length 1·0 to 1·1 mm.

Black with a distinct dark green metallic sheen; strongly punctured with punctures visible at ×12; dorsal surface alutaceous, with meshes of microsculpture more apparent on pronotum; shape moderately convex, outline of elytra subparallel. Metasternum with supra-coxal triangular depression not well defined, alutaceous. Antennae (fig. 25) dark, comparatively stout and hairy, third segment a little shorter than fourth and fifth combined, ninth distinctly shorter than tenth. Legs dark; front pair (fig. 26) with tibia triangular and armed with a tooth on the pre-apical angle, first three tarsal segments broad, comparatively short. Hind wings (fig. 28) atrophied, reduced to short, narrow, ciliated vestiges.

Male.—Aedeagus (fig. 29) with apex of tegmen bilobed ; sclerotized apex of invaginated internal sac of definite shape, as figured.

Holotype ♂, MAURITIUS : Mt. Pouce, 2.xi.1936. Allotype ♀, same particulars. Paratypes, Mt. Pouce, 2.xi.1936, 5 ex. ; Curepipe, 29.iii.1937, 1 ex. ; Mt. Cocotte, 6.ii.1943, 3 ex. (*Raymond Mamet*).

RÉUNION : Plaine des Cafres, 28.x.1937, 3 ex. ; Forêt de Bélouve, i.1955, 3 ex. ; Pic Bébour, 26.i.1955, 1 ex. (*Mission franco-mauritienne*).



FIGS. 25–29.—*Cybocephalus decaeni* sp. n. (25) Antenna ; (26) front leg (Mauritius) ; (27) part of front tibia (Réunion) ; (28) hind wing ; (29) aedeagus.

This small species can be readily separated from all the others from this region by its dark green metallic sheen (more apparent on fresh material), strong puncturation and microsculpture of the dorsal surface. The intensity of this microsculpture is, however, somewhat variable and seems to be a little stronger in the Réunion specimens ; only one example from that island was dissected and it was found to show a slight difference in the shape of the fore tibiae (fig. 27), which are apparently less triangular. The aedeagus is, however, similar in specimens from the two islands, but the cleft or bilobed condition of the tegmen is possibly not a constant characteristic of the species.

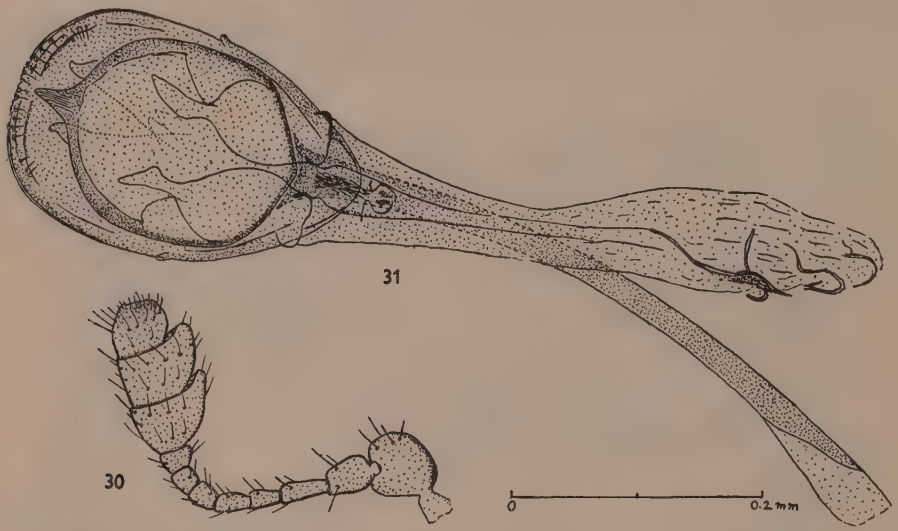
This species is dedicated to the memory of General Charles Decaen, the last French Governor of Mauritius (1803–1810).

Cybocephalus hughscotti sp. n.

Length 1·0 mm.

Male.—Black, oval, rather depressed. Head and elytra alutaceous and fairly densely punctured, punctures only just visible at ×12. Pronotum more glossy and more finely punctured, not appreciably alutaceous. Antennae (fig. 30) testaceous, with basal segment

darker, third segment a little shorter than fourth and fifth combined, ninth and tenth bulky, very distinctly larger than eleventh. Aedeagus (fig. 31) with internal sac comparatively more sclerotized than in the other species of the region, but invaginated apex without any characteristic structure. Hind wings reduced, not longer than elytra and probably unsuitable for flight. Front legs broken.



FIGS. 30, 31.—*Cybocephalus hughscotti* sp. n. (30) Antenna; (31) aedeagus.

Holotype ♂, MAURITIUS: Palmar, 14.xii.1935.

This species is unmistakable in the peculiar microsculpture of the elytra. It is named after Dr. Hugh Scott, F.R.S., formerly of the British Museum (Natural History), in recognition of his early encouragement and help to the writer in the study of Mascarene Coleoptera.

TWO NEW AND POSSIBLY INDIGENOUS APHIDS FROM AUSTRALIA (HOMOPTERA : APHIDOIDEA)

By Mary Carver

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Introduction

It is generally considered that the Australian fauna is greatly deficient or entirely lacking in native aphids. The aphids described below are therefore especially interesting because they may prove to be native to Australia. The only other probable native species known to date is *Anomalaphis comperei* Pergande (Baker, 1920 ; Essig, 1951), which occurs in Western Australia on *Acacia*, *Eucalyptus* and *Agonis flexuosa*. Jarvis (1944) is of the opinion that *Neophyllaphis araucariae* Takahashi (Takahashi, 1937) also has some claims to being indigenous, but this will be difficult to prove. This species is found in Australia and Mauritius on *Araucaria cunninghamii* and in Hawaii on *A. excelsa* (Zimmerman, 1948), but the former host plant is native to Australia, and the latter to Norfolk Island, and it is possible that *N. araucariae* may have accompanied the plants when they were introduced into other countries.

Meringosiphon gen. n.

Body of apterae adorned with long, mostly simple, hairs, situated on low tubercles ; smaller and more slender in alatae. Head with inconspicuous frontal tubercles. Eyes compound, with well developed triommatidia. Antennae six-segmented in both apterae and alatae ; primary rhinaria not ciliated ; alatae with subcircular secondary rhinaria on third antennal segment ; processus terminalis shorter than base of sixth segment. Apical segment of rostrum long, slender and acute. Hind tarsus I with 6–7 hairs. Fore wings with twice-branched media ; wing veins clouded ; hind wings with media and cubitus absent ; hamuli 2. Spiracles slightly tuberculate ; those of abdominal segments I and II far distant from one another. Siphunculi more or less cylindrical, bearing several simple hairs, some of which form an irregular row just before apex. Cauda crescent-shaped, shallow and broad. Subanal plate entire. Gonapophyses 3.

Type of genus : *Meringosiphon paradisicus* sp. n.

Meringosiphon paradisicus sp. n.

Apterous Viviparous Female

Colour of living specimens unrecorded ; probably for the most part brownish.

Mounted specimens : body length 1·55–1·76 mm. (mean 1·65) ; width 0·81–0·96 mm. (mean 0·88). Dorsum adorned with long hairs, 0·05–0·09 mm. long, with stout bases, situated on low tubercles, mostly simple, though some may be bifid at their apices ; head with 3 pairs of hairs on frons, and one row of 4 hairs between eyes ; prothorax with 2 rows each of 4 hairs ; irregularly disposed single rows of hairs on mesothorax, metathorax, and abdominal segments I, II and VIII, and irregular double rows on segments III–VII inclusive. Number of hairs on segments : mesothorax, 6–9 ; metathorax and abdominal segment I, 8–10 ; II, 11–17 ; III and IV, 18–25 ; V, 20–28 ; VI, 13–17 ; VII, 5–9 ; VIII, 4–6. Head and prothorax brownish sclerotic ; mesothorax, metathorax and all abdominal segments with very broad transverse sclerotic bands, which are usually divided in the middle, tra-

versing whole width of segment ; intersegmental sclerites also present. Ventrally, 3–4 pairs of small pale transverse submedian intersegmental sclerites between sternites II–VI, and with spherical pleural sclerites on most sternites ; small spherical sclerites alternate with spiracles. Head smooth or slightly roughened ; frons slightly convex ; frontal tubercles inconspicuous. Eyes compound, with well defined and protruding triommatidia. Antennae six-segmented, 0·84–0·92 mm. long (mean 0·89), brown, without secondary rhinaria ; primary rhinaria without ciliation ; segment I wrinkled at inner basal angle ; segment II with few

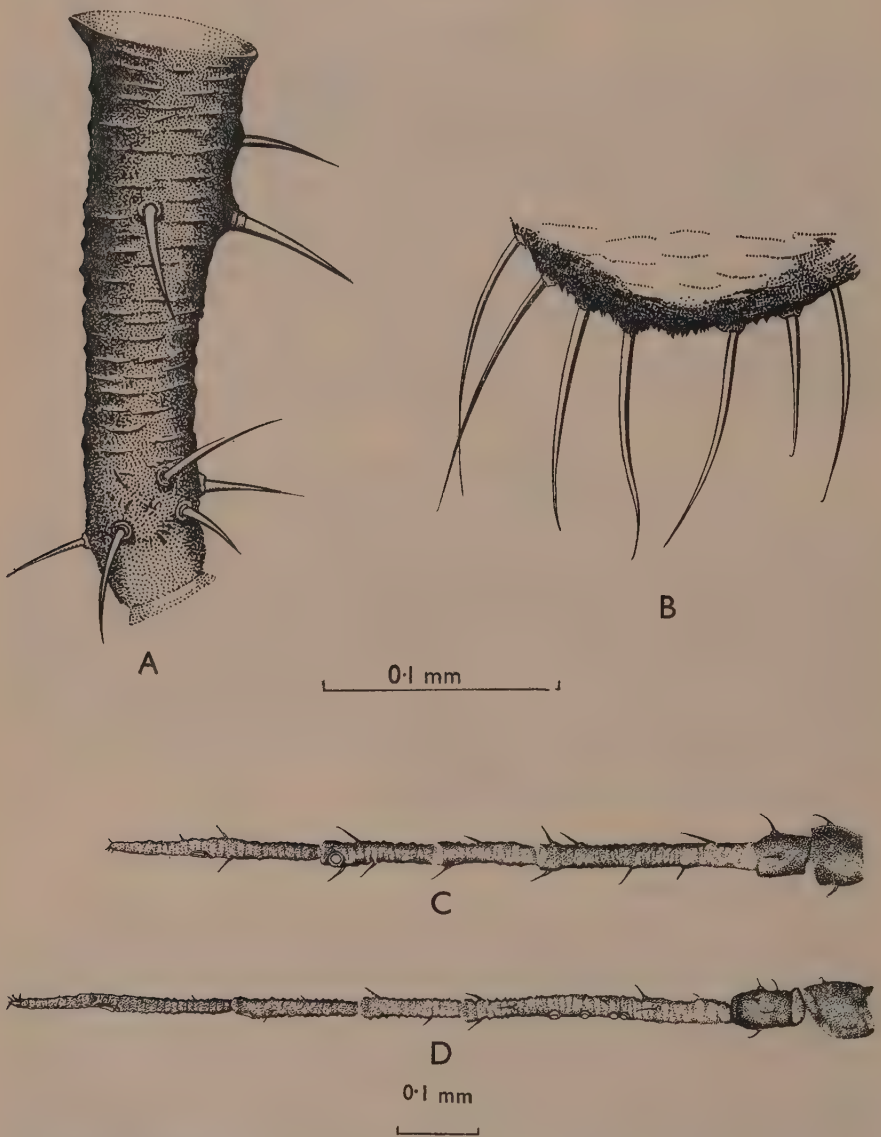


FIG. 1.—*Meringosiphon paradisicus* gen. et sp. n. Apterous viviparous female : A, siphunculus ; B, cauda ; C, antenna. Alate viviparous female : D, antenna.

striations on dorsal surface; segments III–VI imbricated, except usually at extreme base of III. Lengths of segments: I, ± 0·08 mm.; II, ± 0·07 mm.; III, 0·21–0·27 mm. (mean 0·24); IV, 0·11–0·13 mm. (mean 0·12); V, 0·11–0·14 mm. (mean 0·135); VI base, 0·13–0·16 mm. (mean 0·15); VI processus terminalis, 0·1–0·11 mm. Mean ratio, antennal length: body length, 0·54. Rostrum extends to hind coxae or beyond; brown, darker at tip; apical segment long and slender, fairly acute, the sides converging and then widening out slightly distad to preapical hairs; with 8 hairs, in addition to the 2 small preapical pairs; length apical segment, 0·11–0·14 mm. (mean 0·13). Mesosternal furca shortly stalked; arms of furca appear to be jointed near apex. Legs brown; tibia, with exception of apical portion, usually paler than rest of limb; hind tarsus I with 6–7 hairs; length hind tibia, 0·58–0·69 mm. (mean 0·65); hind tarsus I, 0·04 mm.; hind tarsus II, 0·11–0·13 mm. Spiracles slightly tuberculate; those of first and second abdominal segments far distant from one another. Siphunculi more or less cylindrical, but with median side slightly convergent just before apex; flanged; dark brown; surface corrugated rather than imbricated; with 4–6 simple hairs (0·03–0·05 mm. long) in an irregular row just before apex, and with 2–4 hairs irregularly disposed on basal half; length siphunculus, 0·2–0·26 mm. (mean 0·24); mean ratio, siphuncular length: body length, 0·14. Cauda crescent-shaped, shallow and broad, spinosely imbricated, bearing 4–7 hairs, ± 0·09 mm. long (1–2 hairs may be only half as long). A transversely oval, reticulated area, similar to that found in *Anomalaphis* and *Greenidea* is present between cauda and subanal plate. Subanal plate entire; anal margin may be slightly sinuated; imbricated, except for anal marginal area, which is usually reticulated; bearing 17–23 hairs, ± 0·09 mm. long (few hairs may be as small as 0·03 mm.). Subgenital plate faintly imbricated, with 10–15 hairs, ± 0·04 mm. long, distributed over whole area of plate. Gonapophyses 3; outer gonapophyses each consisting of 3–5 gonochaetae, inner one of 2–3 gonochaetae.

Host unknown. Swept from areas in which *Daviesia divaricata* Benth. (Leguminosae) was dominant.

Types. Holotype, 10 paratypes, W. Australia: Perth, King's Park, 25.vii.1952, 20–22.x.1952, 30.x.1952 (*G. F. Bornemissza*).

Alate Viviparous Female

Colour unrecorded.

Mounted specimen: body length, 1·71 mm. Dorsal abdominal hairs 0·04–0·05 mm. long, smaller and more slender than those of apterous morph, except those on tergite VIII, which are 0·09–0·1 mm. Irregularly disposed single rows of hairs on tergites I, II and VIII, and irregular double rows on tergites III–VII inclusive. Number of hairs on abdominal segments: I, 8; II, 13; III, 15; IV, 16; V, 18; VI, 11; VII, 8; VIII, 7. Head and thorax brownish sclerotic. Abdomen with marginal sclerites on tergites II–V inclusive and with pale sclerites (? scleroites) at bases of dorsal setae, which tend to coalesce on tergites VII and VIII; spherical intersegmental sclerites also present. Ventrally, small, narrow, pale, transverse, intersegmental sclerites are present between sternites III and IV, and IV and V. Eyes compound, with well developed and protruding triommatidia. Antennae 1·0 mm. long, six-segmented, brown, with 4, 5, small subcircular, protruding secondary rhinaria in a single row on middle area of third antennal segment. Segment I wrinkled at inner basal angle; segment II faintly imbricated on ventral surface; segments III–VI imbricated. Lengths of segments: I, 0·09 mm.; II, 0·08 mm.; III, 0·31 mm.; IV, 0·13 mm.; V, 0·15 mm.; VI base, 0·16 mm.; VI processus terminalis, 0·11 mm. Ratio, antennal length: body length, 0·59. Rostrum as in apterous morph. Fore wings with media twice-branched; wing veins brown, with slightly clouded borders, especially cubital and anal veins. Hind wings with both media and cubitus absent; hamuli 2. Legs brown; tibia, with exception of apical portion, paler than rest of limb; hind tarsus I with 6 hairs; length of hind tibia, 0·75 mm.; hind tarsus I, 0·036 mm.; hind tarsus II, 0·2 mm. Siphunculi cylindrical, imbricated, paler and more slender than in apterous morph; with 5 hairs (± 0·04 mm.

long) near apex, and 2, 4 hairs on basal half. Length siphunculi, 0·3 mm. Ratio, siphuncular length : body length, 0·17. Cauda spinosely imbricated, with 6 hairs (± 0·08 mm. long). An oval reticulated area is present between cauda and subanal plate. Subanal plate nearly square in outline, except that anal margin is sinuated ; spinosely imbricated ; bearing 19 hairs (± 0·09 mm. long). Subgenital plate faintly imbricated, with 16 hairs (± 0·05 mm. long) dispersed over whole area of plate.

Host unknown. Swept from area in which *Daviesia divaricata* Benth. (Leguminosae) was dominant.

Type. Morphotype alata, W. Australia : Perth, King's Park, 20.x.1952 (*G. F. Bornemissza*).

The type series is deposited in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Meringosiphon paradisicus belongs to the subfamily Trichosiphoninae of Börner and Heinze (1957). On the basis of siphuncular structure, it appears to be most closely related to *Anomalaphis comperei* Pergande from Western Australia (Baker, 1920 ; Essig, 1951), and *Anomalosiphum pithecolobii* Tak. from Formosa and China (Takahashi, 1934 ; Essig, 1951). It further resembles these two genera in the reduction of the hind wing venation, in the short processus terminalis and in the prominent triommatidia.

It differs significantly from *Anomalaphis* and *Anomalosiphum*, however, in the absence of spinal tubercular structures on the posterior abdominal tergites, in the six-segmented antennae (they are five-segmented in *Anomalaphis* and *Anomalosiphum*), and in the twice-branched media of the fore wing.

Further differences from *Anomalaphis* lie in the more slender apical rostral segment, in the long, mostly simple, dorsal body setae (they are short and foliate in *Anomalaphis*), and in the absence of well developed lateral tubercles in the apterae.

Further differences from *Anomalosiphum* are in the rounded cauda (pointed in *Anomalosiphum*), the rounded antennal rhinaria (they are transverse and numerous in *Anomalosiphum*), and in the clouded wing veins.

Neophyllaphis gingerensis sp. n.

Apterous Viviparous Female

Live specimens : body purplish-blue, covered with a whitish pulverulence.

Mounted specimens : body 1·45–1·74 mm. long (mean 1·61), 0·82–1·04 mm. wide (mean 0·95). A pale sclerotic patch on frons and vertex, and sclerotic patches around eyes ; the abdomen pale except for small inconspicuous scleroites at bases of dorsal hairs, spiracular sclerites and a transverse brown band on eighth tergite. Body hairs simple, frontal hairs ± 19 μ long, dorsal abdominal hairs ± 8 μ. Head fused with prothorax, without frontal tubercles. Head and prothorax bear dorsally 3 pairs of (?) glandular pores, the first pair behind antennae, 3–5 celled, the second between the eyes, 2–5 celled, and a multicellular pair on prothoracic region, dorsal to first coxae. Eyes consisting of only 3 facets. Antennae 0·55–0·69 mm. long (mean 0·63), brown, without secondary rhinaria. Primary rhinaria ciliated. Hairs small, on third segment ± 11 μ long. Segment I wrinkled at inner basal angle ; segment II with faint longitudinal striations apically and basally ; segment III slightly expanded at base, faintly imbricated apically ; segments IV–VI imbricated. Lengths of segments : I, 0·05–0·06 mm.; II, 0·06 mm.; III, 0·16–0·22 mm. (mean 0·19) ; IV, 0·07–0·10 mm. (mean 0·08) ; V, 0·08–0·12 mm. (mean 0·10) ; VI base, 0·09–0·12 mm. (mean 0·10) ; VI processus terminalis, 0·02–0·04 mm. Mean ratio, antennal length :

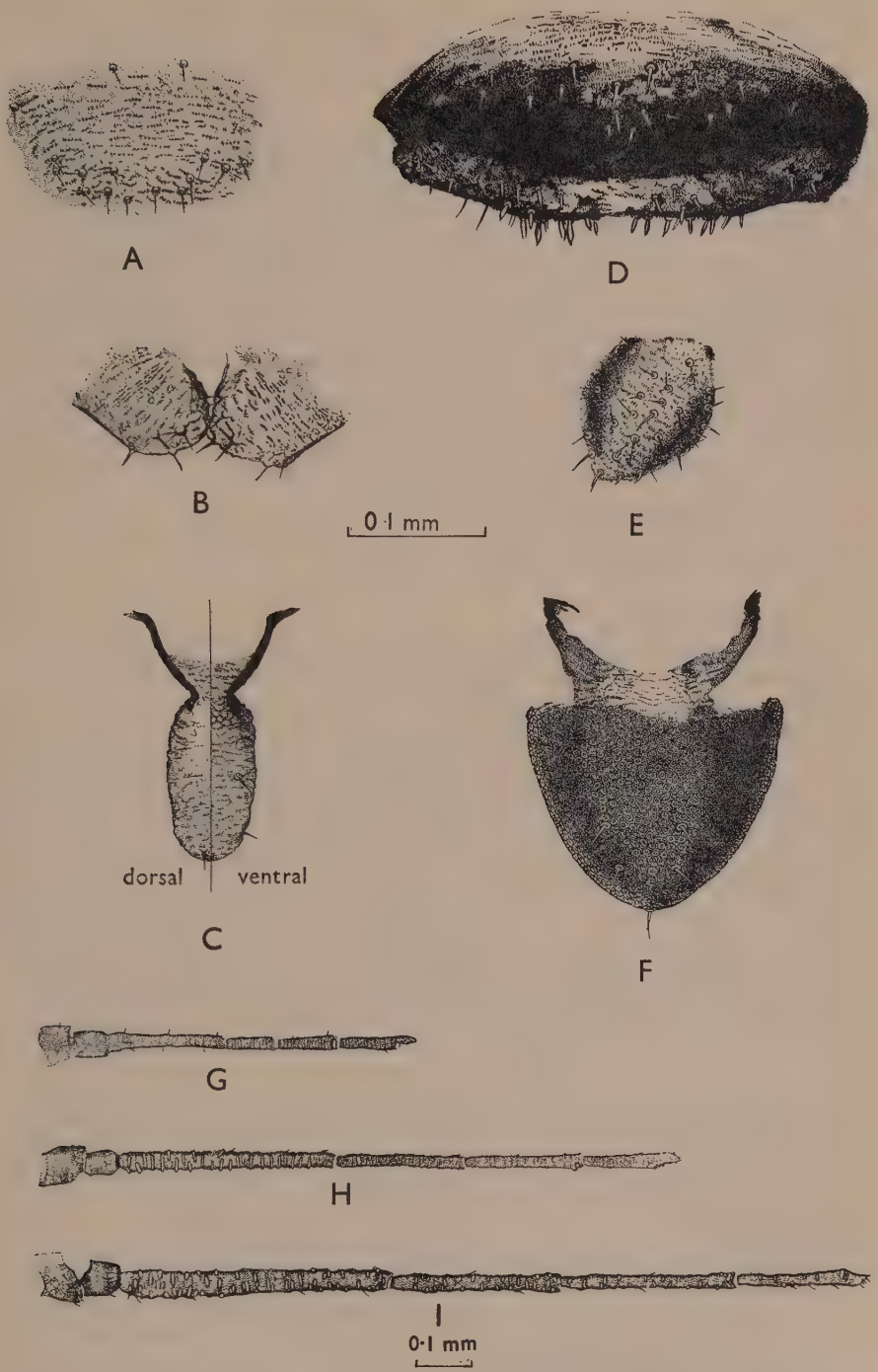


Fig. 2.—*Neophyllaphis gingerensis* sp. n. Apterous viviparous female: A, subgenital plate; B, subanal lobes; C, cauda; G, antenna. Oviparous female: D, subgenital plate; E, subanal lobe; F, cauda. Alate viviparous female: H, antenna. Male: I, antenna.

body length, 0·4. Rostrum usually extending to third coxae ; proximally pale, mottled with faint brown areas ; penultimate segment brown ; apical segment brown, black at extreme tip, blunt at apex, with one pair of small hairs basosubmarginally, in addition to the 3 preapical pairs. Length apical segment, 0·06–0·07 mm.; width, 0·04–0·05 mm. Mesosternal furca two-parted, inconspicuous. Legs brown ; hind tarsus I with 5–7 hairs. Length hind tibia, 0·37–0·44 mm. (mean 0·41) ; hind tarsus I, 0·03–0·04 mm.; hind tarsus II, 0·1–0·12 mm. Spiracles of first and second abdominal segments not situated close together. Siphunculi pore-like, only slightly elevated above dorsum, brown ; diameter siphuncular aperture, 0·03–0·04 mm. Cauda constricted at about basal third to form an approximately cylindrical knob ; brown and imbricated except for a pale central patch dorsally on basal half of knob ; imbrications sometimes form a honeycomb-like pattern ventrally at base of knob ; with 2 pairs of ventrolateral hairs and 1 dorsal subapical one. Length cauda, 0·16–0·21 mm. (mean 0·18) ; length knob, 0·11–0·14 mm. (mean 0·12). Subanal plate divided into 2 well defined and separated lobes ; brown, imbricated, with 5–10 hairs ($\pm$ 25 μ long) on each lobe. Length of lobes, 0·07–0·11 mm. (mean 0·09). Subgenital plate brown, imbricated, with 2–4 hairs anteriorly and 8–13 hairs on posterior margin ($\pm$ 21 μ long); width, 0·14–0·18 mm. (mean 0·16). Gonapophyses 4 ; 2 outer gonapophyses, each consisting of 2, rarely 3, gonochaetae, and 2 inner ones each consisting of 1–2, rarely 3, gonochaetae.

Host. *Podocarpus alpina* R. Br.

Types. Holotype, 24 paratypes, A.C.T.: near summit of Mt. Gingera (6092 feet), 14.xii.1954 (*M. Carver*).

Alate Viviparous Female

Live specimens : head black, prothorax brown, thoracic lobes black ; abdomen reddish-brown to blackish-brown ; legs black. Pulverulence on head and thorax sparse ; on abdomen disposed in segmental bands.

Mounted specimens : body 1·44–1·65 mm. long (mean 1·57). Head brown, thorax blackish-brown. Abdomen with small, inconspicuous scleroites at bases of dorsal hairs and with brown spiracular sclerites. Head without frontal tubercles ; frons bearing a dark chitinous V-shaped ridge, the apices of which meet the anterior margins of the antennal foramina. Eyes compound, with well defined triommatidia. Antennae 1–1·16 mm. long (mean 1·1), brown ; segment I wrinkled at inner basal angle ; segment II imbricated ventrally ; segments III–VI imbricated ; secondary rhinaria on segment III 20–25 in number, extending over whole length of segment, mostly semi-annular or nearly so, a few being smaller and narrowly oval ; segment IV with 0–2 narrowly oval rhinaria, usually near middle of segment. Lengths of segments : I, 0·07–0·09 mm.; II, 0·06–0·07 mm.; III, 0·35–0·39 mm. (mean 0·37) ; IV, 0·19–0·24 mm. (mean 0·22) ; V, 0·19–0·21 mm. (mean 0·2) ; VI base, 0·12–0·14 mm.; VI processus terminalis, 0·03 mm. Mean ratio, antennal length : body length, 0·7. Rostrum as in previously described morph. Fore wings with media twice branched ; veins brown ; length, 1·79–2·07 mm. (mean 1·91). Hind wings with both media and cubitus present ; length, 1·02–1·14 mm. (mean 1·08). Legs brown ; hind tarsus I with 7–9 hairs ; hind tibia bears 0–8 pseudosensoria, similar to those of oviparous female. Length of hind tibia, 0·6–0·7 mm.; hind tarsus I, 0·04 mm.; hind tarsus II, 0·12–0·13 mm. Siphunculi as in previously described morph. Cauda smaller than that of apterous viviparous female, and no honey-combing effect visible ventrally at base of knob ; otherwise similar. Length cauda, 0·13–0·17 mm. (mean 0·16) ; length knob, 0·08–0·1 mm. (mean 0·09). Subanal lobes well defined and separated, brown, imbricated, with 9–14 hairs on each lobe ; length of lobes, 0·09 mm. Subgenital plate brown, imbricated, bearing 4–7 hairs anteriorly, and 13–17 hairs on posterior margin. Width, 0·16–0·22 mm. (mean 0·19). Outer gonapophyses each consisting of 2–3 gonochaetae, inner ones each consisting of 2 gonochaetae.

Host. *Podocarpus alpina* R. Br.

Types. Morphotype alata, 5 paratypes, A.C.T.: slopes of Mt. Ginini,

18.i.1957 (*M. Carver*); 1 paratype, near summit of Mt. Gingera (6092 feet), 18.i.1955.

Some of these specimens are badly mutilated.

Oviparous Female

Live specimens: body purplish-blue, dusted with a white pulverulence. Cauda black, covered all over with short white waxy filaments.

Mounted specimens: body apterous, but possessing some alatoid characteristics; 1·09–1·74 mm. long (mean 1·48), 0·53–0·94 mm. wide (mean 0·81). A sclerotic patch on frons and vertex; the abdomen pale, except for small inconspicuous scleroites at bases of dorsal hairs, and brown spiracular sclerites. Head distinct from prothorax, without frontal tubercles; head and prothorax with 3 pairs of (?) glandular pores, often very faintly developed, the first pair behind antennae 3–5 celled, another pair between eyes 2–3 celled, and a multicellular pair on prothorax. Eyes compound, with well-developed triommatidia; small median ocellus present ventrally on frons. Antennae 0·51–0·99 mm. long (mean 0·84), brown, without secondary rhinaria; segment I sometimes wrinkled at inner basal angle; segment II with faint longitudinal striations apically and basally; segment III not expanded at base, faintly imbricated on apical half, basal half with short longitudinal striations; segments IV–VI imbricated. Lengths of segments: I, 0·05–0·09 mm.; II, 0·05–0·07 mm.; III, 0·16–0·35 mm. (mean 0·28); IV, 0·07–0·16 mm. (mean 0·12); V, 0·08–0·16 mm. (mean 0·13); VI base, 0·09–0·14 mm. (mean 0·12); VI processus terminalis, 0·02–0·04 mm. Mean ratio, antennal length : body length, 0·55. Rostrum as in apterous viviparous female. Length apical segment, 0·05–0·06 mm.; width, 0·03–0·04 mm. Thoracic sternum showing an appreciable amount of alatiform sclerotic development. Legs brown; hind tibiae not swollen, or only very slightly so, with 8–28 small, circular pseudosensoria (mean 17) on basal two-thirds of segment, with exception of extreme base (one specimen bore only 0, 1 pseudosensoria); hind tarsus I with 6–9 hairs. Length hind tibia, 0·36–0·60 mm. (mean 0·5); hind tarsus I, 0·03–0·04 mm.; hind tarsus II, 0·09–0·13 mm. (mean 0·12). Siphunculi as in apterous viviparous female. Cauda dark brown, constricted to form a large, globular apical portion or knob; knob bears all over surface a distinctive pattern having the appearance of wax gland pores; with 2 pairs of ventrolateral hairs and one dorsal subapical hair. Caudal length, 0·17–0·27 mm. (mean 0·22); length caudal knob, 0·10–0·16 mm. (mean 0·14); width, 0·13–0·21 mm. (mean 0·17). Subanal plate divided into 2 globular lobes; brown and imbricated, with 21–31 hairs, $\pm$ 33 μ long, on each lobe, plus 2 hairs near apex, which are short, stout and curved; length lobes, 0·07–0·13 mm. (mean 0·10). Subgenital plate large, transverse and imbricated, consisting of 2 overlapping parts; brown with the overlapping portion darker; bearing 12–27 hairs on anterior portion and 33–52 on posterior portion; many hairs on posterior portion spatulate; spatulate hairs $\pm$ 16 μ long; width subgenital plate, 0·3–0·41 mm. (mean 0·36). Gonapophyses each consisting of 1–3 gonochaetae.

Host. *Podocarpus alpina* R. Br.

Types. Morphotype ovipara, 8 paratypes, A.C.T.: near summit of Mt. Gingera (6092 feet), 18.i.1955, 1.ii.1955, 11.ii.1955; 1 paratype, slopes of Mt. Ginini, 18.i.1957 (all *M. Carver*).

Note.—The paratype from Mt. Ginini possessed more distinct alatoid characteristics than the other specimens, *viz.*: two secondary rhinaria on third segment of left antenna, a larger median ocellus and one small lateral ocellus, and a V-shaped chitinous ridge on frons.

Male

Live specimens: similar in appearance to alate viviparous female.

Mounted specimens: body alate, 1·19–1·68 mm. long (mean 1·5). Abdomen with almost indiscernible scleroites at bases of dorsal hairs in some specimens, brown spiracular sclerites,

and a narrow transverse band on ventral surface, anterior to genitalia. Antennae 1·31–1·58 mm. long (mean 1·46), brown; segment I wrinkled at inner angle of base; segment II sometimes with faint imbrications; segment III with imbrications on apical half, and sometimes with faint longitudinal striations on basal half; segments IV–VI imbricated; secondary rhinaria small, narrowly oval, distributed evenly over whole length of segments, except in segment VI, where they are confined to the basal two-thirds of base. Number of secondary rhinaria on III, 57–66; IV, 17–25; V, 11–19; VI, 5–7. Lengths of segments: I, 0·07–0·09 mm.; II, 0·06–0·07 mm.; III, 0·45–0·59 mm. (mean 0·51); IV, 0·25–0·31 mm. (mean 0·28); V, 0·25–0·32 mm. (mean 0·28); VI base, 0·16–0·21 mm. (mean 0·18); VI processus terminalis, 0·04 mm. Mean ratio, antennal length : body length, 0·95. Legs brown; hind tarsus I with 7–10 hairs; length hind tibia, 0·65–0·79 mm. (mean 0·7); hind tarsus I, 0·04 mm.; hind tarsus II, 0·12–0·14 mm. Cauda 0·11–0·14 mm. long; length knob, 0·06–0·08 mm. Subanal lobes pale brown on apical half, imbricated, with 9–14 hairs on each lobe; length of lobes, 0·05–0·07 mm. Genitalia darkish brown. Other non-sexual characters similar to those of alate viviparous female.

Host. *Podocarpus alpina* R. Br.

Types. Allotype, 6 paratypes, A.C.T.: near summit of Mt. Gingera (6092 feet), 18.i.1955, 11.ii.1955 (*M. Carver*).

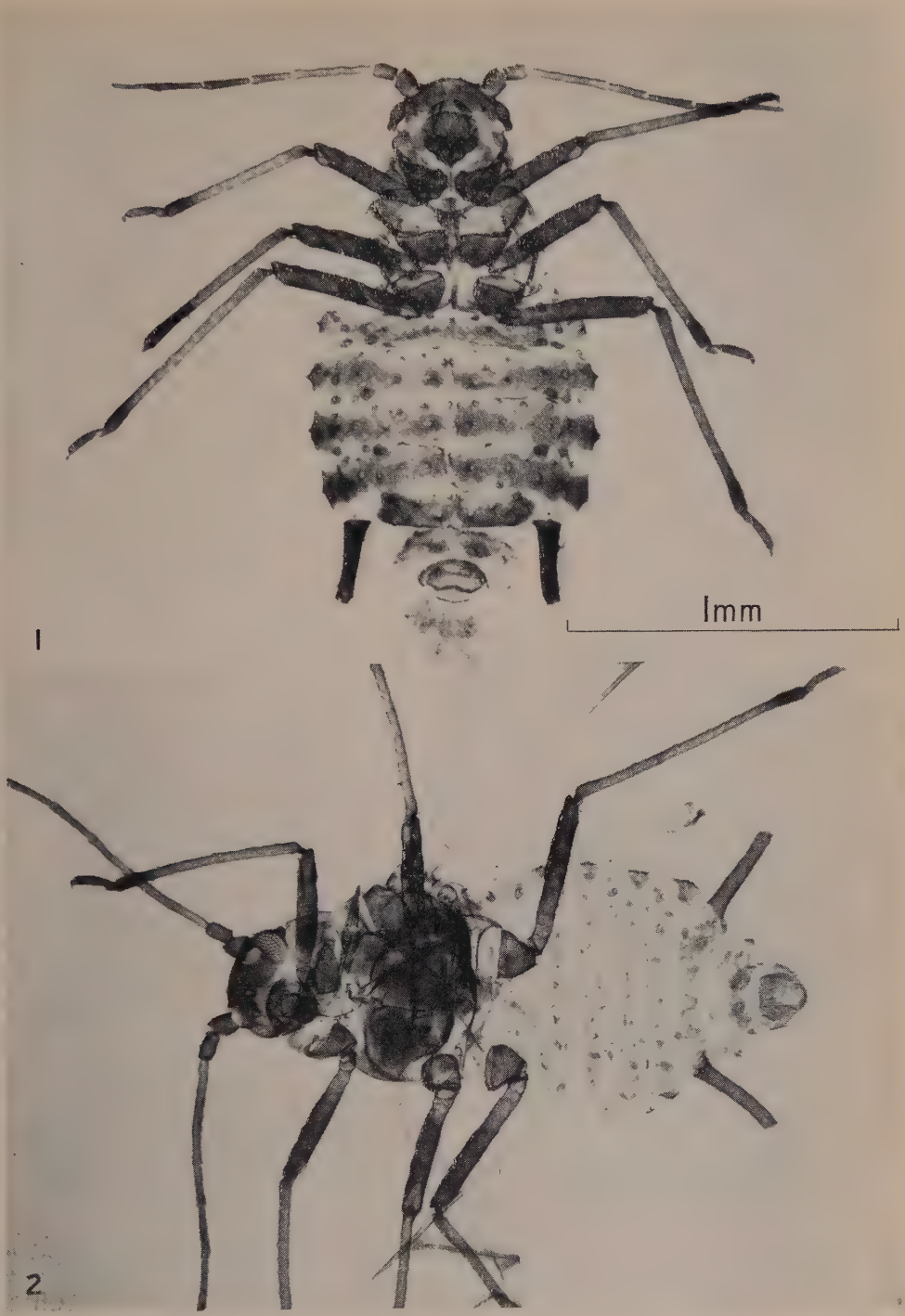
The type series of all morphs is deposited in the Division of Entomology Museum, C.S.I.R.O., Canberra.

N. gingerensis agrees closely with the generic conception of *Neophyllaphis* Takahashi, except that the oviparous female is apterous. It differs from descriptions of *N. podocarpae* Tak. (Takahashi, 1920, 1921, 1924) and *N. totarae* Cottier (Cottier, 1952) in the complete division, in all morphs, of the anal plate into separate lobes and, in the alate viviparous female, in the different number of secondary rhinaria on the third antennal segment and the usual presence of secondary rhinaria on the fourth. It differs further from the description of *N. totarae* in the different markings on the cauda and the differently shaped hairs of the subgenital plate of the oviparous female. From *N. araucariae* Tak. (Takahashi, 1937) it can be distinguished by its purple colour and pulverulence, and by the six-segmented antennae of all morphs. (*N. araucariae* is yellow in colour and is non-pulverulent; the antennae are five-segmented in the apterous viviparous female, and five to six segmented in the alate form; the sexuales are unknown.)

Pseudosensoria are known to occur on the hind tibiae of alate viviparous females of *N. podocarpae*, *N. araucariae* and *N. totarae* as well as on those of *N. gingerensis* (Takahashi, 1924, 1937; Cottier, 1952).

N. gingerensis is found singly or in small groups on the leaves of *P. alpina*, being mostly confined to the purple-coloured shoots, where it is well camouflaged. It is rather inactive, except when disturbed.

In December 1954, collections consisted entirely of apterous viviparae. In January 1955 and 1957 and early February 1955, the species was plentiful and sexuales were present in appreciable numbers. At the end of February 1957, the numbers were very small, the sample consisting of apterous viviparae and sexuales. In May 1957, no aphids at all could be found. Alate viviparae were rare; the few specimens found were collected in January 1955 and 1957. Ova have not been discovered. The presence of sexuales in early summer is an unusual occurrence in aphids, but the same phenomenon has also been recorded for *N. podocarpae* and *N. totarae* (Takahashi, 1921, 1923; Cottier, 1952).



Meringosiphon paradisicus gen. et sp. n.

Fig. 1.—Apterous viviparous female. Fig. 2.—Alate viviparous female.

M. Carver.

Neophyllaphis gingerensis sp. n.

Fig. 3.—Apterous viviparous female.

Fig. 4.—Oviparous female.

Summary

Two new aphids are described, *Meringosiphon paradisicus* gen. et sp. n. and *Neophyllaphis gingerensis* sp. n., which may prove to be indigenous to Australia.

Acknowledgments

The author is indebted to Mr. K. L. Taylor who first discovered *Neophyllaphis gingerensis* sp. n., and to Messrs. L. A. Marshall and D. H. Wilson for preparing the illustrations and photographs.

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Book Notices.

Hymenoptera of America north of Mexico : Synoptic Catalog. First Supplement. Edited by Karl V. Krombein. 8vo. Washington, 1958. [*Agric. Monogr. U.S. Dep. Agric.* **2**.] Pp. 305. Price $1.75.

The main volume of the work to which this is the First Supplement was published in July, 1951 and contained references to literature published up to and including 1949 and part of 1950. The need for periodic supplements to keep pace with the great amount of research being made on Hymenoptera was soon apparent and the present work covers literature published between 1950 and 1956.

In format it follows that of the earlier volume. Categories above specific rank are arranged in systematic order, and others alphabetically under their generic or subgeneric headings. Some major groups were incorrectly placed in the main Catalogue and these changes are noted in the text with cross-references where necessary.

The Supplement also covers extensions in geographic range ; new hosts, prey or flower-visiting records ; corrections of errors and omissions ; citations to synonymy published since completion of the manuscript for the Catalogue, and some previously unpublished synonymy ; and changes in rank of included forms.

There is an index to superspecific and trivial names, and a list of the new names proposed in this Supplement.

Atlas des Hyménoptères de France, Belgique, Suisse. Par L. Berland. 2me éd. 2 tom. 8vo. Paris (Editions N. Boubée), 1958. Pp. 155, 14 pls., text illust. ; Pp. 184, 14 pls., text illust. Price 1800 Frs. each. [*Nouvel Atlas d'Entomologie*, No. 7.]

This work was originally planned in three parts, the first of which appeared in 1947. While preparing the next two parts, it became apparent that the planning had not been on a scale consistent with the importance of this group of insects and it was therefore agreed to bring out a new edition in an expanded form.

The work consists of an introductory chapter on general morphology, ecology, reproduction, social life, distribution and classification, followed by sections on the various orders : Tenthredinoidea, Cynipoidea, Ichneumonoidea, Chalcidoidea, Proctotrypoidea, Formicoidea.

The volumes contain many text-figures in addition to 28 coloured plates depicting some 366 species.

Volume II contains an index of genera and higher groups with references to the relevant text figures and plates.

ON A COLLECTION OF FIG INSECTS (CHALCIDOIDEA : AGAONTIDAE) FROM FRENCH GUINEA.

By K. J. Joseph.

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The insects described in this paper were collected by Dr. M. Lamotte and R. Roy with Berlese's Apparatus at Mont Nimba, in French Guinea, in October 1951, and handed to me for identification by Dr. C. Delamare Deboutteville. The type specimens are deposited in the Paris Museum of Natural History.

Agaon tridentatum sp. n.

Female.—Length 1·75 mm. Yellowish-brown ; eyes coralline ; wings hyaline.

Head (fig. 1 (1)) : long, a little over one-and-a-half times longer than wide between external margins of eyes ; lateral margin forwards of eye a little longer than longitudinal diameter of eye. Antenna (fig. 1 (2)) eleven-segmented ; scape twice as long as broad, with a distinct angular projection on its external margin as in figure ; second segment one and two-thirds as long as broad ; third long, narrowed towards the distal end, two and five-sevenths as long as broad, without apical spine ; fourth attached to baso-lateral region of the third, narrow at base, about twice as long as broad ; fifth, sixth, seventh and eighth segments similar ; fifth two and two-thirds as long as broad ; sixth about two and three-fourths as long as broad ; seventh long, narrow, a little over four times as long as broad ; eighth distinctly longer and broader than seventh ; ninth with a narrow distal half feebly chitinized, about two and one-third times as long as its maximum breadth; tenth subfusiform, feebly chitinized distally, about two and one-third times as long as its maximum breadth ; eleventh subfusiform with a narrow basal stalk, a little less than twice as long as its maximum width ; segments five to eight with a single whorl of very long filiform setae (sensoria) ; segments nine, ten and eleven with at least two whorls of similar structures. Mandible (fig. 1 (3)) a little longer than wide, tridentate, with about five complete and five incomplete transverse carinae ventrally ; mandibular appendage about four times as long as the mandible, about eight times as long as broad and with about 45 rows of teeth.

Thorax : one and a half times as long as width of mesonotum. Fore wing a little over two and a half times as long as wide ; marginal vein (fig. 1 (4)) three-fifths the post-marginal and one and one-third the stigmal ; stigmal vein with its four sensillae arranged as in figure. Fore leg with coxa about three and a half times as long as wide ; femur five times as long as wide ; tibia (fig. 1 (5)) short, a little over one-third the femur, a little less than twice as long as wide, with sensillae, setae and two apical dentate processes as in figure. Tarsi a little longer than thrice the tibia ; metatarsus shorter than the three following segments combined. Hind leg with coxa subcompressed, twice as long as wide ; femur distinctly longer than coxa, a little over thrice as long as wide ; tibia (fig. 1 (6)) a trifle longer or as long as femur, a little less than seven times as long as wide, with two dentate processes apically ; tarsi about one and two-thirds as long as tibia ; metatarsus a little longer than half the length of the three following segments combined.

Abdomen : length equal to twice width ; cerci of ninth segment with three long setae ; projecting part of ovipositor longer than abdomen.

Holotype.—One female dissected on slide.

Affinities.—*Agaon tridentatum* sp. n. is closely related to *A. fasciatum* Waterston, from which it differs in the following characters: (1) the external margin of the scape is more rounded; (2) the mandibles bear three teeth, and the mandibular appendage only about 45 rows of teeth; (3) the fore wing is narrower with the wing veins of different proportions.

Alfonsiella longiscapa sp. n.

Female.—Length 1·28 mm. Head yellowish-brown; thorax, abdomen and legs honey-yellow; wings hyaline; eyes blackish-brown.

Head (fig. 1 (7)): distinctly longer than wide between external margins of eyes; lateral margin forwards of eye about three-fifths longitudinal diameter of eye. Antenna (fig. 1 (8)): scape as in figure, with a narrow basal half and a large lamelliform distal process, two and a half times as long as wide; second segment one and a half times as long as broad, third and fourth small; segments five to eleven similar, subfusiform, each with a whorl of very long setae (sensoria); eighth one and one-fifth as long as broad; eleventh smallest, one and a half times as long as broad. Mandible (fig. 1 (9)): one and one-third times as long as wide, unidentate; ventral surface with about ten transverse carinae; mandibular appendage a little over twice as long as mandible, narrow, eleven times as long as broad, with about 33 rows of teeth on its ventral surface.

Thorax: length equal to twice width of mesonotum. Fore wing a little less than two and one-third times as long as wide; marginal vein (fig. 1 (10)) about twice the post-marginal and a little longer than the stigmal; stigmal vein as in figure, with four sensillae. Fore leg with coxa about twice as long as wide; femur about two and a half times as long as wide; tibia (fig. 1 (11)) distinctly less than half femur, two and a half times as long as broad, with two dentate processes apically as in figure; tarsi four-fifths the femur, metatarsus two-thirds the length of the three following segments combined. Hind leg with coxa twice as long as wide; femur equal to coxa, a little over twice as long as wide; tibia (fig. 1 (12)) a little shorter than femur, three and two-thirds as long as wide, with a pair of odontoid processes apically, as in figure; tarsi one and two-thirds times as long as femur; metatarsus two-thirds the length of the three following segments combined.

Abdomen: a little less than twice as long as broad; cerci of ninth segment with four long setae; projecting part of ovipositor shorter than abdomen.

Holotype.—1 female dissected on slide.

Paratypes.—14 females in alcohol.

Affinities.—*Alfonsiella longiscapa* sp. n. differs from the only other known species of the genus, *A. fimbriata* Waterston, mainly in the form of the antennal scape, the number of rows of teeth on the mandibular appendage, and the different proportions of the wing veins.

Alfonsiella fimbriata Waterston

Alfonsiella fimbriata Waterston, 1920, *Ent. mon. Mag.* **56**: 198–200.

This species was first described by Waterston (*loc. cit.*) from Tanganyika. I refer to it 13 females.

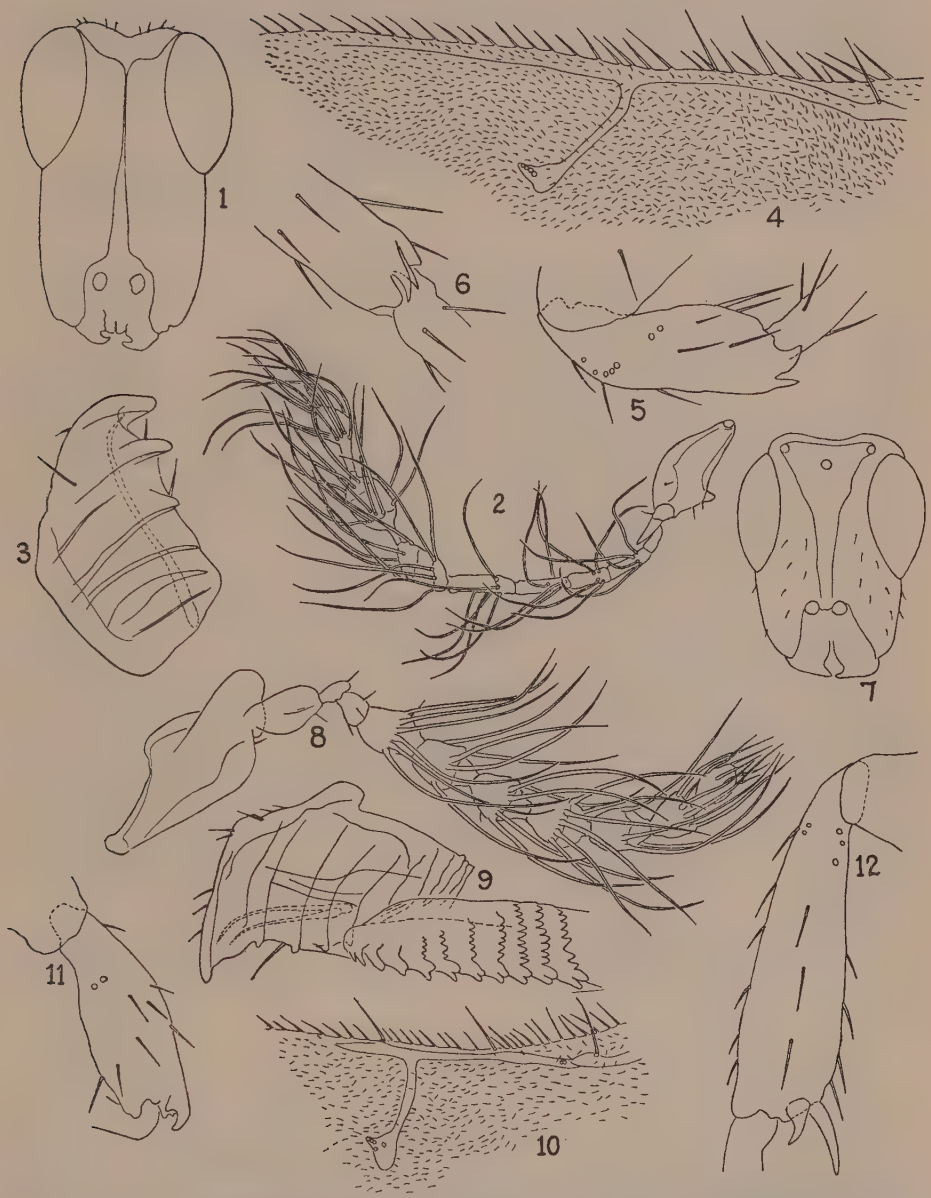

FIG. 1.—(1)–(6) *Agaon tridentatum* sp. n. (1) head; (2) antenna; (3) mandible; (4) fore wing, venation; (5) fore tibia; (6) hind tibia. (7)–(12) *Alfonsiella longiscapa* sp. n. (7) head; (8) antenna; (9) mandible; (10) fore wing, venation; (11) fore tibia; (12) hind tibia.

Allotriozoon heterandromorphum Grandi

Allotriozoon heterandromorphum Grandi, 1916, *Boll. Lab. Zool. Portici* **10** : 201–206.

This species was first described by Grandi (*loc. cit.*) from the figs of *Ficus vogelii* Miquel from French Guiana and Senegal. I refer to it 35 females.

Allotriozoon prodigiosum Grandi

Allotriozoon prodigiosum Grandi, 1916, *Boll. Lab. Zool. Portici* **10** : 192–200.

This species was first described by Grandi (*loc. cit.*) from the Gold Coast. I refer to it 12 females.

Blastophaga articulata sp. n.

Female.—Length 1·63 mm. Castaneous; legs honey-yellow; antennae dark sooty-brown; eyes dark brownish; wings hyaline, nervures amber.

Head: a little longer than wide between external margins of eyes; lateral margin forwards of eye shorter than longitudinal diameter of eye. Antenna (fig. 2 (1)) with scape a little over thrice as long as wide, subcompressed and as in figure; segments five to eleven with very long setae (sensoria) which project distinctly beyond distal margin of these segments. Mandible (fig. 2 (2)) a little longer than wide, bidentate, with about 14 ventral carinae, the inner margins of three of which project beyond internal margin of mandible; mandibular appendage about three and one-fourth as long as mandible, about five times as long as wide, with about 41 rows of teeth.

Thorax: about one and five-sevenths as long as width of mesonotum; peritremes of prothoracic spiracles distinctly projecting beyond postero-lateral margin. Fore wing about two and one-fourth times as long as wide, closely pilose; marginal vein (fig. 2 (3)) less than half the post-marginal and equal to the stigmal; stigmal vein as in figure, with 4 sensillae. Fore leg with coxa a little less than two and one-third times as long as wide, its ventral margin with a series of setiform structures as in figure; femur about thrice as long as wide; tibia (fig. 2 (4)) a little over one-third the femur, more than twice as long as broad; tarsi about four-fifths the femur, metatarsus shorter than the three following segments combined. Hind leg with coxa about one and three-fourths as long as wide; femur a little over twice as long as wide; tibia (fig. 2 (5)) over seven-eighths the femur, about three and a half times as long as broad; tarsi distinctly longer than one and a half times the femur, metatarsus three-fourths the combined length of the three following segments.

Abdomen: length about one and a half times width; spiracular peritremes of eighth segment large; ninth tergite submembranous, cerci with three long setae; projecting part of ovipositor longer than abdomen.

Holotype.—1 female dissected on slide.

Paratypes.—34 females in spirit.

Affinities.—This species is easily distinguished from all the other known African species principally by the form of its antennal flagellar segments, which possess a distinct distal membranous retractile collar and a whorl of very long sensoria, noticeably longer than the segments which bear them.

Blastophaga pectinata sp. n.

Female.—Length 2·1 mm. Head and abdominal tergites castaneous; thorax melleous; lateral regions of propodeum yellowish-brown; wings hyaline.

FIG. 2.—(1)–(5) *Blastophaga articulata* sp. n. (1) antenna ; (2) mandible ; (3) fore wing, venation ; (4) fore tibia ; (5) hind tibia. (6)–(10) *Blastophaga pectinata* sp. n. (6) antenna ; (7) mandible ; (8) fore wing, venation ; (9) fore tibia ; (10) hind tibia.

Head : longer than wide between external margins of eyes ; lateral margin forwards of eye three-fifths longitudinal diameter of eye. Antenna (fig. 2 (6)) with scape subcompressed and as in figure ; segments five to ten similar, each with a whorl of long and rod-like sensoria. Mandible (fig. 2(7)) longer than wide, distinctly bidentate with the apical tooth dorsal and prolonged into a subapical angular projection ; mandibular appendage about three and a half times as long as mandible, four and one-third times as long as its own width, with about 47 rows of teeth on its ventral surface.

Thorax : one and a half times as long as width of mesonotum. Fore wing about two and one-fourth as long as wide ; marginal vein (fig. 2 (8)) a little longer than half the post-marginal and distinctly longer than the stigmal. Fore leg with coxa a little over twice as long as wide ; femur thrice as long as wide ; tibia (fig. 2 (9)) a little over one-third the femur, two and one-third times as long as wide ; tarsi three-fourths the femur, metatarsus three-fourths length of the three following segments combined. Hind leg with coxa one and two-thirds as long as wide ; tibia (fig. 2 (10)) about two-thirds the femur, two and three-fourths as long as wide ; tarsi one and a half times as long as femur, metatarsus about two-thirds length of the three following segments combined.

Abdomen : less than twice as long as broad ; spiracular peritreme of eighth segment subcircular, large ; cerci of ninth segment with three setae ; projecting part of ovipositor about as long as abdomen.

Holotype.—1 female dissected on slide.

Paratypes.—1 female on slide and 23 females in spirit.

Affinities.—This species is easily distinguishable from all other described African species, principally by : (1) the form of its antenna of which the scape is subcompressed, flat, elongated, and extends distinctly beyond the point of attachment of the second segment ; and (2) by the very numerous and rod-like sensoria borne by the flagellar segments (similar to those in the genus *Eupristina* Saunders).

Ceratosolen longicornis sp. n.

Female.—Length 2·1 mm. Head and abdomen yellowish-brown ; thorax and legs pale brownish-yellow ; wings hyaline ; eyes coralline.

Head : a little wider than long between external margins of eyes ; lateral margin forwards of eye less than one-third longitudinal diameter of eye. Antenna (fig. 3 (1)) ten-segmented ; scape massive, a little less than twice as long as broad ; fifth segment one and one-third as long as broad ; sixth long, about thrice as long as its maximum breadth ; eighth broader than seventh and ninth, one and two-thirds as long as broad, tenth broader than preceding segments, a little less than two and a half times as long as its own breadth ; segments five to ten with setae and sensoria as in figure. Mandible (fig. 3 (2)) about one and one-fourth times as long as wide, with six ventral carinae, teeth as in figure ; mandibular appendage twice as long as wide, with five ventral carinae. Maxilla (fig. 3 (2)) four times as long as its lateral bacilliform process, with three lateral setae ; bacilliform process with a long terminal seta. Labium as in figure 3 (2), with a single seta.

Thorax : thorax and propodeum a little longer than one and a half times width of mesonotum. Fore wing about two and one-fifth times as long as wide ; marginal vein (fig. 3 (3)) one and one-fourth as long as the stigmal, slightly shorter than the post-marginal. Fore leg with tibia (fig. 3 (4)) a little shorter or equal to metatarsus and distinctly longer than half coxal length. Hind leg with tibia (fig. 3 (5)) two and three-fifths as long as wide, a little shorter than metatarsus, with complex teeth as in figure ; metatarsus shorter than the three following segments combined.

Abdomen : one and one-third times as long as broad ; projecting part of ovipositor a little longer than the abdomen.

Holotype.—1 female dissected on slide.

Paratypes.—1 female on slide and 1 female in spirit.

Affinities.—Ceratosolen longicornis sp. n. is related to *C. myersi* Grandi

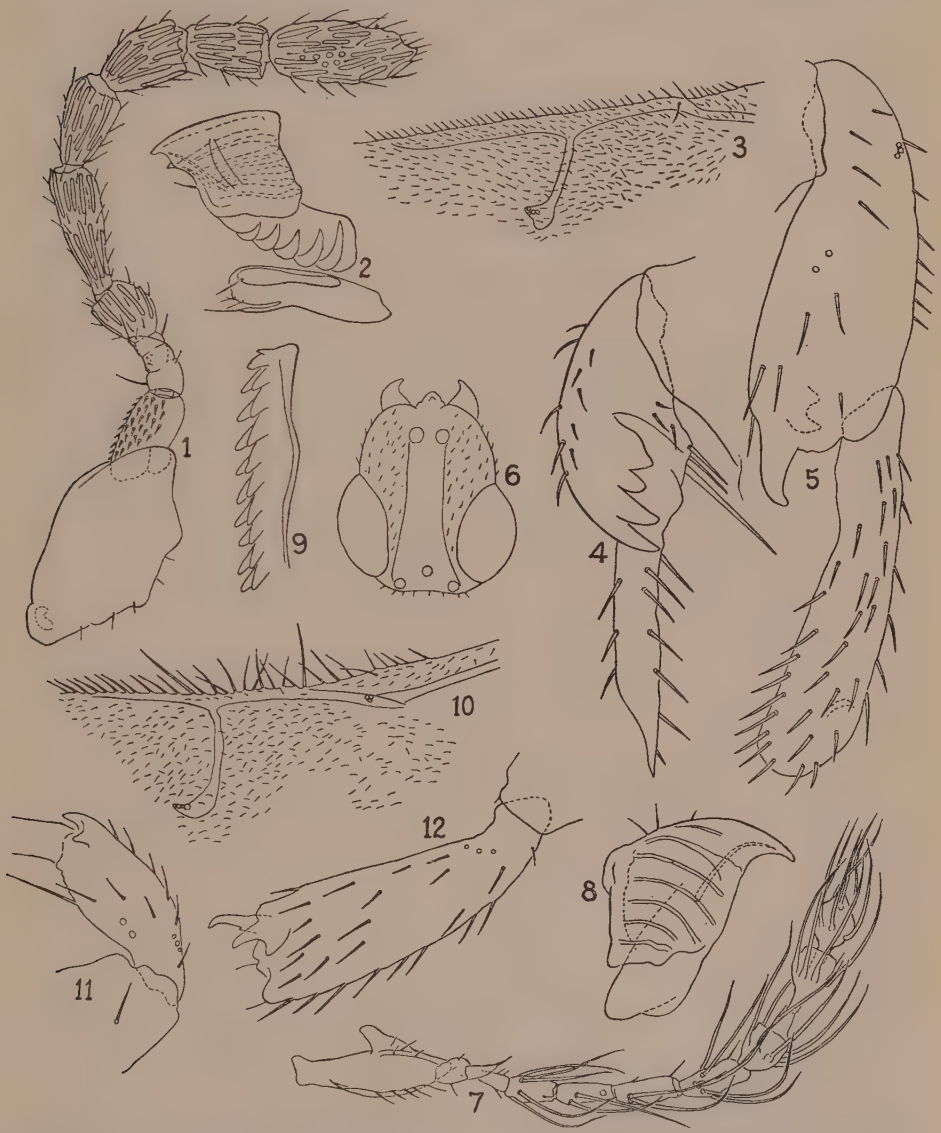

Fig. 3.—(1)–(5) *Ceratosolen longicornis* sp. n. (1) antenna ; (2) mandible, maxilla, labium ; (3) fore wing, venation ; (4) fore tibia ; (5) hind tibia. (6)–(12) *Paragaon perplexum* sp. n. (6) head ; (7) antenna ; (8) mandible ; (9) mandibular appendage ; (10) fore wing, venation ; (11) fore tibia ; (12) hind tibia.

described from *Ficus rhodesiaca* Warb. in Southern Rhodesia, and to *C. arabicus* May living in *Ficus sycomorus* L. in Yemen and Eritrea, but is clearly distinguishable by the length of the sixth antennal segment, which is shorter in the other two species, and in several other characters.

Paragaon gen. n.

Head a little longer than wide between external margins of eyes. Antenna eleven-segmented ; scape with a prominent angular projection on its internal margin ; the antenna generally strongly resembling that of the genus *Agaon*. Mandible distinctly unidentate ; mandibular appendage with about 20 rows of teeth on its ventral surface, each row consisting of only two teeth. Marginal vein as long as the post-marginal and equal to the stigmal.

Affinities.—The genus *Paragaon* shows strong resemblance to the genus *Agaon* in the form of the antenna, but differs from it in all other characters.

Type species.—*Paragaon perplexum* sp. n.

Paragaon perplexum sp. n.

Female.—Length 1·35 mm. Head and abdomen castaneous ; thorax and antennae yellowish-brown ; legs melleous ; wings hyaline ; eyes reddish-brown.

Head (fig. 3 (6)): a little longer than wide between external margins of eyes ; lateral margin forwards of eye equal to three-fourths longitudinal diameter of eye. Antenna (fig. 3 (7)) with scape twice as long as its greatest width, with a prominent backwardly directed angular process on its inner margin ; second segment a little over one and a half times as long as broad ; third small, longer than twice its breadth, with a long apical seta ; fifth, sixth, seventh and eighth segments similar, distinctly longer than broad ; fifth a little less than twice as long as broad ; sixth a little longer, but less broad ; seventh longer than sixth, a little less than thrice as long as its own breadth ; eighth larger than seventh, two and a half times as long as broad ; ninth and tenth segments with a long and narrow distal submembranous part ; ninth a little less than twice as long as broad ; tenth about two and a half times as long as broad, with a distinct basal pedicel ; segments five to ten with a whorl of long setae (sensoria), eleventh with two whorls. Mandible (fig. 3 (8)) about one and four-fifths as long as broad, distinctly unidentate as in figure, with about six ventral carinae ; mandibular appendage (fig. 3 (9)) about twice as long as the mandible and about eleven times as long as its own width, with about 20 rows of teeth ventrally, each row with two teeth.

Thorax : one and three-fifths times as long as mesonotum. Fore wing two and one-fourth as long as broad ; marginal vein (fig. 3 (10)) as long as post-marginal and equal to the stigmal ; stigmal as in figure, with 4 sensillae. Fore leg with coxa two and a half times as long as wide ; femur thrice as long as wide ; tibia (fig. 3 (11)) a little less than half the femur, a little longer than two and a half times its maximum breadth, with two apical dentiform processes as in figure ; tarsi about six-sevenths the femur, metatarsus two-thirds the combined length of the three following segments. Hind leg with coxa a little less than twice as long as broad, subcompressed ; femur a little over twice as long as broad ; tibia (fig. 3 (12)) a little over five-sixths the femur, a little longer than thrice its own breadth, with setae, sensillae and two apical dentate processes as in figure ; tarsi one and a half times as long as femur, metatarsus three-fifths the combined length of the three following segments.

Abdomen : about twice as long as broad ; spiracular peritremes of eighth segment small ; cerci of ninth segment with 3 setae ; projecting part of ovipositor longer than abdomen.

Holotype.—1 female dissected on slide.

Paratype.—1 female on slide.

NEW SPECIES OF *PERIPSOCUS* HAGEN, 1866 (CORRODENTIA: PERIPSOCIDAE) FROM HONG KONG ISLAND, WITH FURTHER DESCRIPTIONS OF *PERIPSOCUS SIMILIS* ENDERLEIN, 1903 AND *PERIPSOCUS QUERCICOLA* ENDERLEIN, 1906

By I. W. B. Thornton

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Introduction

Enderlein (1903) described *Peripsocus similis* and *P. reicherti* from Singapore, and *P. suffitus* from New Guinea. He also listed *Peripsocus piger* and *P. aethiops* originally described by Hagen from Ceylon. These two species were originally placed in *Psocus* (Hagen, 1859) and later transferred to *Peripsocus* (Hagen, 1866). The original descriptions are inadequate, there being no description of the hind wing or genitalia, and since Hagen states that in both cases the pterostigma is oblong rectangular there is the possibility that these two species should be placed in *Ectopsocus* McL., 1894. I have been unable to trace the original material and, until this is possible, this point must remain in abeyance. *P. reicherti* was later recorded from the Seychelles (Enderlein, 1931), and *P. suffitus* from Guam (Banks, 1942). Two species of the genus have been found in Japan, *Peripsocus quercicola* Enderlein, 1906, and *P. pumilus* End., 1907. *Peripsocus ignis* Okamoto, 1910, from the original figures of the wings, is clearly a species of *Ectopsocus*. *P. quercicola* was re-described by Okamoto (1910) and was recorded from Formosa by Banks (1937), who also described a new species, *Peripsocus singularis*, from the same island. Only three species appear to have been collected from the Chinese mainland: *P. hedinianus* Enderlein, 1936 from South Kansu, and *P. fulvescens* Navas, 1921 and *P. nanus* Navas, 1922, both from Tonkin.

In this paper descriptions of two new species of the genus are given, together with a further description of the females of *P. similis* and *P. quercicola* which were briefly described by Enderlein (1903 and 1906 respectively) without description of genitalia.

Peripsocus similis Enderlein

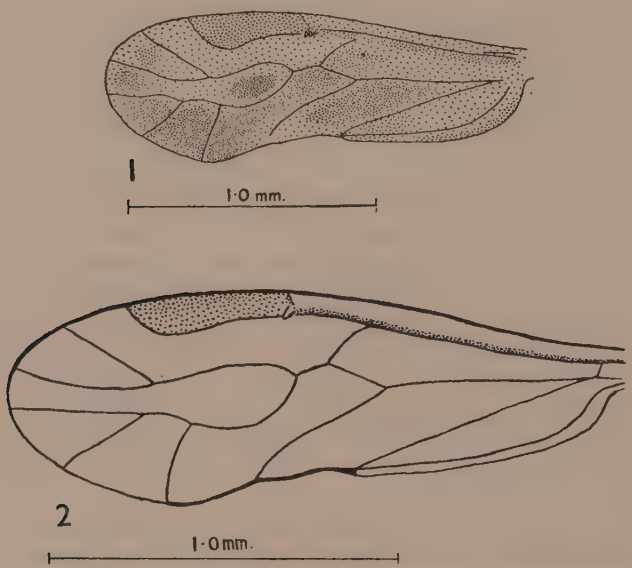
Female (*Redescription*)

Coloration (freshly killed, in alcohol). Head generally pale buff, with light brown markings. Median epicranial suture black for posterior two-thirds, rest faint. Postclypeus brown pubescent with faint white diagonal fine streaks, meeting in mid-line at right angles to each other. Mid-line also a fine pale streak; anteclypeus pale, labrum brown, pubescent. Genae pale, with two faint brown parallel bands beneath the eye and faint brown coloration round antennal socket. Antennae pale brown. Eyes black. Maxillary palps light brown, last joint darker. Thoracic sclerites mid-brown with median pale yellowish band along the terga, and also a similar but transverse band along posterior margin of the dorsum of the mesothorax and of the metathorax. Meso- and metathoracic scutella yellowish, pale; sutures between antedorsum and dorsum of mesothorax dark brown, sharp; sutures between metathoracic and mesothoracic dorsal lobes similar. Coxae

brown, colourless distally ; trochanters colourless ; femora, tibiae and tarsi medium brown. Fore wing (fig. 1) with dark patches in medial cells, between *rr* and *m*, and in proximal cells *R* and *M* + *Cu*. Hind wing with brown pigmentation in costal cell for two-thirds of its length in marginal half of cell only. Abdomen pale buff, with faint broad granulated markings on the terga, sometimes only apparent laterally ; apical sclerites brown.

Morphology.—Subgenital plate (fig. 3) apically bilobed, the apices bearing a number of long setae; main body of plate evenly covered with setae and with a wide U-shaped sclerotised portion posteriorly, in the middle of which the setae rather denser posteriorly.

A field of 17 trichobothria on the paraprocts.



Figs. 1—2.—Left fore wing of : (1) *Peripsocus similis* End. ; (2) *P. quercicola* End.

Gonaphyses (fig. 6) : ventral valve (first valvula) acuminate, bearing ill-defined short recurved spines on ventral border. Dorsal valve (second valvula, following Broadhead, 1950 ; *not* Badonnel, 1943) large, bearing long setae along its apical margin, particularly dorsally ; external valve (third valvula) subrectangular, extending well past middle of dorsal valve, and furnished with long setae, particularly marginally.

Number of ctenidiobothria on first joint of hind tarsus : 11 (Enderlein gives 10).

Dimensions.—Length of body (in alcohol) : 1·50 mm.

Length of wings, of joints of hind leg, of antennae, and of first three segments of flagellum, as in Table I.

Hong Kong Island : on *Pinus massoniana*, ix.57, xii.57, 3 ♀.

This species is rare in Hong Kong, and no males have been taken.

I have not been able to examine Enderlein's type specimen, but the pattern of pigmentation of the fore wing figured by him agrees well with that of my specimens. Although the colours, *e.g.* of the labrum, in my specimens differ from those given by Enderlein, the wing pattern, wing length, thoracic tergites and anteclypeus are so similar that this is undoubtedly the same species. Enderlein also describes the wing pigmentation as being " hyaline perforated ",

FIGS. 3–5.—Subgenital plate of female : (3) *Peripsocus similis* End. ; (4) *P. quercicola* End. ; (5) *P. spinosus* sp. n.

TABLE I.—*Length (in mm.) of various characters of three females of* Peripsocus similis

Fore wing (Fw) (Enderlein 1·5 mm.)	1·451	1·550	1·506
Hind wing (Hw)	1·154	1·280	1·198
Femur (F)	0·267	0·289	0·281
Tibia (T)	0·484	0·550	0·517
First tarsal joint (t_1)	0·144	0·152	0·136
Second tarsal joint (t_2)	0·067	0·075	0·072
Antenna (A)	0·890	0·989	—
First flagellar segment (f_1)	0·142	0·163	0·144
Second flagellar segment (f_2)	0·099	0·112	0·102
Third flagellar segment (f_3)	0·094	0·106	0·088
Ratio t_1/t_2 (Enderlein 2·0)	2·15	2·04	1·89
Ratio f_1/f_2	1·43	1·45	1·42

as in *Micropsocus erosus* End., 1903, but to a lesser degree. This is in agreement with my specimens.

Peripsocus similis can be readily distinguished from the other three species mentioned in this paper by its much smaller size, and by the pattern of pigmentation on the fore wing. This pattern somewhat resembles that of *P. alboguttatus* Dalman. The latter species is, however, much larger, and the subgenital plate is not bilobed.

Peripsocus quercicola Enderlein

FEMALE (*Redescription*)

Coloration (freshly killed, in alcohol). Head generally pale cream, with faint brown markings. Vertex with pale brown confluent spots across median epicranial suture posteriorly and along posterior margin of vertex, extending to posterior border of eyes. Thin faint brown markings extending forwards from posterior border of eyes to meet the median fuscous patch anteriorly, leaving two paler circular areas on either side of median suture. Ommatidial protuberance dark brown. Postclypeus with vague brown parallel markings and noticeable white pubescence; anteclypeus brown; labrum dark brown. Genae pale yellowish-brown. Epicranial suture dark brown. Eyes black, ocelli pale. Maxillary palps mid-brown. Antennae with scape and pedicel pale yellowish-brown, flagellum fuscous. Thoracic terga mid-brown, paler adjacent to sutures; pleura paler brown. Legs pale, tibiae and tarsi fuscous. Claws brown basally, colourless distally. Wings light yellowish-brown by transmitted light. Abdomen dorsally pale cream, with narrow transverse brown bands, ventrally colourless; apex dark brown.

Morphology.—Median epicranial suture distinct, anterior sutures faint.

In fore wing (fig. 2) posterior border from nodus to end of *m* strongly thickened. Number of ctenidiobothria on first joint of hind tarsus: 17–18.

Apical lobe of subgenital plate (fig. 4) truncate; on each side a dark band about one-quarter of the width of the lobe, the latter setose in posterior half with a conspicuous row of setae just anterior to its posterior margin; body of plate setose, particularly over the wide V-shaped dark sclerotised region.

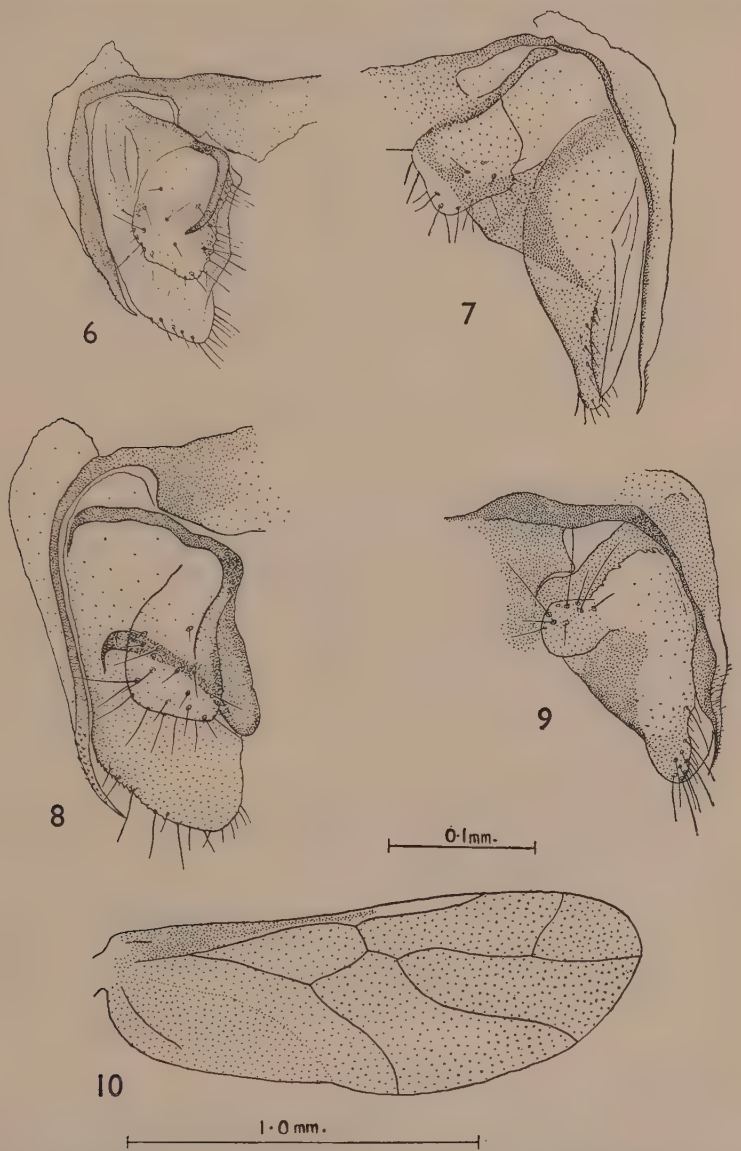
A field of 30 trichobothria on each paraproct.

Gonapophyses (fig. 7): ventral valve (first valvula) styliform, sharply pointed, point slightly curved and with recurved setae ventrally; dorsal valve (second valvula) narrowed towards the tip, which carries short fine hairs; external valve (third valvula) sub-quadrangular, extending for less than one-third the length of the dorsal valve, and bearing numerous long setae.

Dimensions : Body length (in alcohol) : 1·79 mm.
Dimensions of other characters as in Table II.

Hong Kong Island : on *Pinus massoniana*, ix.57, xii.57, iv.58 ; on *Rhaphiolepis indica*, xi.56 (1 ♀ in each case).

Again this species is rare in Hong Kong, and no males have been collected.



Figs. 6–10.—(6)–(9) Female gonapophyses of : (6) *Peripsocus similis* End. ; (7) *P. quercicola* End. ; (8) *P. spinosus* sp. n. ; (9) *P. fasciatus* sp. n. (10) Right hind wing of *P. fasciatus* sp. n.

This species resembles *P. spinosus* in wing length and in lack of pattern on the fore wing. The two can be readily distinguished by the genitalia, *quercicola* lacking spines on the subgenital plate and having a relatively shorter external valve of the gonaphyses. The straight truncate posterior edge of the lobe of the subgenital plate is also distinctive.

TABLE II.—*Length (in mm.) of various body characters of four females of* Peripsocus quercicola

Fw	2·282	2·269	2·205	2·333
Hw	.	.	1·744	1·795
F	.	.	0·440	0·445
T	.	.	0·824	0·857
t_1	.	.	0·224	0·236
t_2	.	.	0·104	0·107
A	.	.	1·440	1·451
f_1	0·291	.	0·278	0·294
f_2	.	.	0·184	0·208
f_3	.	.	0·179	0·200
Ratio t_1/t_2	.	.	2·15	2·21
Ratio f_1/f_2	.	.	1·51	1·41

Peripsocus spinosus sp. n.

FEMALE

Coloration (freshly killed, in alcohol). Head generally pale cream, markings light brown; ommatidial protuberance dark sepia; post-clypeus with brown markings close together and often merging; anteclypeus white; labrum dark brown. Genae light brown, with a pale cream area beneath the eye extending to the antennal socket. Antennae brown. Eyes black, shining grey. Maxillary palps brown, last joint a little darker. Thoracic sclerites brown. Coxae brown, colourless distally; trochanters colourless; femora faint brown; tibiae and tarsi brown. Fore wings (fig. 11) uniformly light brown, except for a small hyaline area at distal end of vein cu_1 and another such area at junction of *rr* and *m*. Hind wings almost hyaline. Abdominal terga pale cream, with transverse granulated brown band on posterior third, these bands often very indistinct; apical abdominal sclerites brown.

Morphology: Epicranial sutures fine.

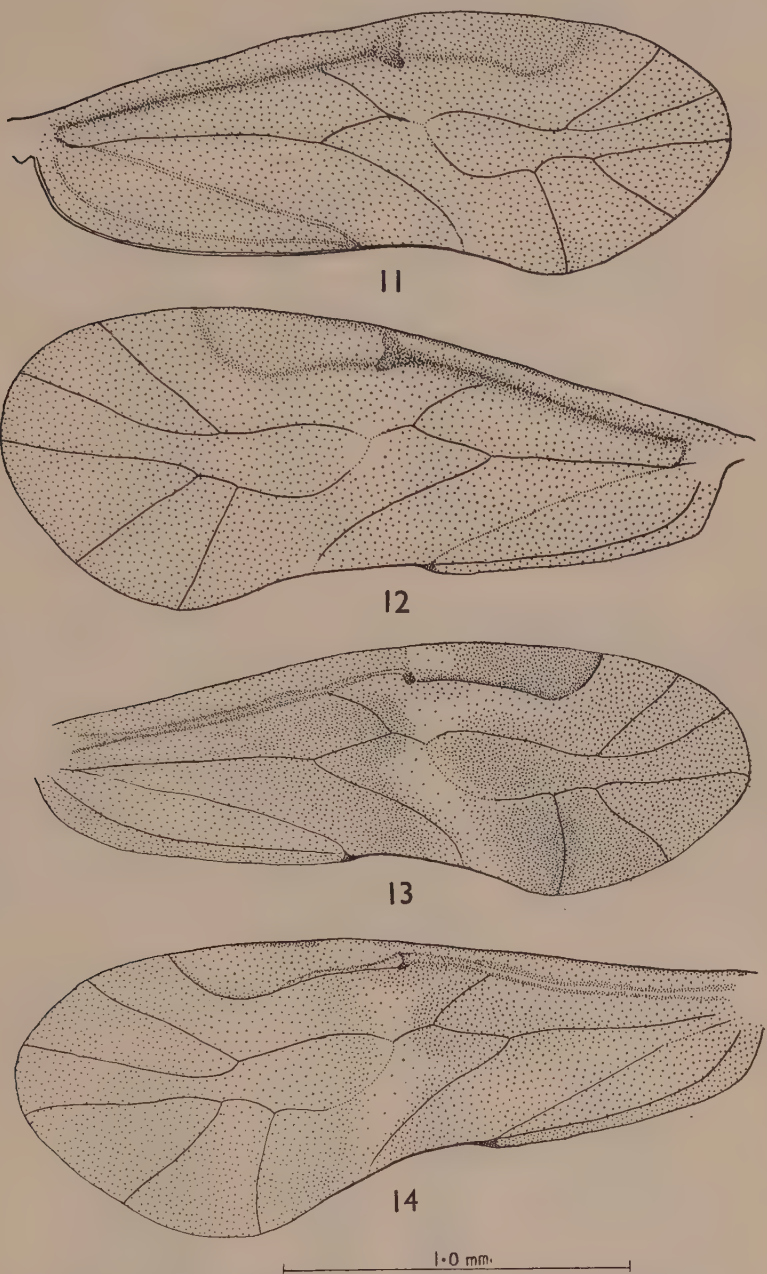
In the fore wing, distal portion of $m + r$ and origin of m_1 and *rr*, and distal part of cu_1 faint. Stigmasac large. Number of ctenidiobothria on first joint of hind tarsus: 10–15 (25 specimens, average 12).

Subgenital plate (fig. 5) apically bilobed, each lobe bearing about ten long setae; outer edges of apical lobe sclerotised for about one-quarter of the width; a tract of small spines present down the centre from its posterior edge, widening and dividing into three tracts which extend into the main body of the plate, one median, two lateral. Main body of the plate well sclerotised, except for two lateral areas anteriorly; uniformly clothed with long setae. At either side a flat heavily sclerotised lobe present where apical lobe joins the plate.

A field of 19 trichobothria on each paraproct.

Gonapophyses (fig. 8): ventral valve (first valvula) curved, styliform, with short recurved spines ventrally; dorsal valve (second valvula) large, subtriangular, with fairly long setae on distal edge and short spines on ventral edge distally; external valve (third valvula) subquadrangular, bearing about a score of long setae, and extending further than half length of dorsal valve.

Dimensions: Body length (in alcohol): 2·06 mm.



FIGS. 11–14.—(11)–(12) *Peripsocus spinosus* sp. n. (11) Right fore wing of female ; (12) left fore wing of male. (13)–(14) *P. fasciatus* sp. n. : (13) right fore wing of female ; (14) left fore wing of male.

Various body characters of 25 females were measured, and the means and ranges of these are given in Table III. Coefficients of variability of these characters range from 3·2 (fore wing length) to 7·4 (first flagellar segment).

TABLE III.—*Length (in mm.) of various characters of* 25 *females of* Peripsocus spinosus

	Mean	Standard deviation	Observed extremes
Fw	2·006	0·064	1·897–2·179
Hw	1·572	0·057	1·436–1·692
F	0·391	0·023	0·341–0·440
T	0·741	0·036	0·687–0·824
t_1	0·204	0·013	0·187–0·240
t_2	0·107	0·004	0·096–0·115
A	1·295	0·065	1·176–1·407
f_1	0·244	0·018	0·208–0·278
f_2	0·164	0·010	0·142–0·187
f_3	0·149	0·011	0·134–0·168
Ratio t_1/t_2	1·92	0·137	1·71 –2·22
Ratio f_1/f_2	1·49	0·078	1·33 –1·64

MALE

Coloration (freshly killed, in alcohol). Head and thorax, as the female. Abdomen pale cream to white, and transverse bands on the terga very thin and faint, almost confined to posterior border of each tergum; apical structures dark brown.

Morphology.—Fore wing (fig. 12) with venation as in female, but wing somewhat broader and more bluntly rounded at the apex.

Genitalia (fig. 18): penial frame ("cadre pénien" of Badonnel) closed anteriorly; parameres fused posteriorly forming a "beak" and bearing two pairs of short internal arms. Transverse penial sclerite bearing one median and two pairs of lateral long pointed sclerites, all these directed posteriorly.

Dimensions. Various body characters of 24 males were measured and the means and ranges are given in Table IV. Coefficients of variability for these characters ranged from 2·5 (fore wing length) to 6·0 (second flagellar segment).

TABLE IV.—*Length (in mm.) of various characters of* 24 *males of* P. spinosus

	Mean	Standard deviation	Observed extremes
Fw	2·043	0·053	1·949–2·128
Hw	1·591	0·078	1·487–1·692
F	0·406	0·015	0·374–0·440
T	0·786	0·030	0·703–0·841
t_1	0·227	0·012	0·203–0·254
t_2	0·112	0·006	0·102–0·120
A	1·754	0·077	1·649–1·901
f_1	0·322	0·014	0·297–0·345
f_2	0·231	0·014	0·203–0·254
f_3	0·202	0·007	0·188–0·216
Ratio t_1/t_2	2·03	0·109	1·82 –2·21
Ratio f_1/f_2	1·40	0·056	1·26 –1·49

Hong Kong Island: on *Pinus massoniana*, xii.57, ii.58, iv.58, frequent. Holotype ♀ and allotype ♂ in author's collection. A male and female paratype will be deposited in the British Museum (Natural History).

The extensive fields of spines on the subgenital plate are distinctive for the female of this species. It is the only species known in which the transverse penial sclerite of the male carries two pairs of lateral sclerites.

Peripsocus fasciatus sp. n.

Female

Coloration (freshly killed, in alcohol). Head generally buff, markings light brown. Epicranial sutures dark brown. On the vertex the paler areas posteriorly almost completely separated from the pale area anteriorly by light brown markings. Ommatidial protuberance dark brown. Post-clypeus with light brown parallel markings; anteclypeus white; labrum dark sepia. Genae buff, with faint brown marking from edge of eye to antennal socket. Antennae brown. Maxillary palpi brown. Eyes brown-black. Thoracic terga brown, pleura a little lighter. Legs with coxae light brown, fading to colourless distally; trochanter and femur colourless; tibia and tarsus brown. Fore wing (fig. 13) with mid-brown pigmentation but an ill-defined transverse lighter band about mid-way along the wing extending also into proximal part of pterostigma. Hind wing (fig. 10) paler; costal cell brown for proximal two-thirds of its length, hyaline distally. Abdomen with uniform granulated light brown pigmentation dorsally, buff ventrally; apical sclerites brown.

Morphology.—Epicranial sutures distinct

In fore wing, vein *rs* faint for a very short distance from its origin, vein *m* faint for about ten times this distance from its junction with *rs*. Stigmasac small. Number of ctenidiobothria on first joint of hind tarsus: 11–17 (25 specimens—average 14).

Terminal lobe of subgenital plate (fig. 15) ill-defined, apically bilobed, with long setae and short spines bordering the V thus formed; the two lobes and the main body of the plate immediately anterior and lateral to them heavily sclerotised; body of plate roughly U-shaped, sclerotised at outer edge of tips of arms of the U; setose only in anterior half.

Epiproct with numerous long setae. Paraprocts each with a field of 22 trichobothria.

Gonapophyses (fig. 9): ventral valve (first valvula) styliform, with numerous recurved moderately long hairs on its ventral edge; dorsal valve (second valvula) subtriangular, somewhat lobed at the tip, which bears many long setae on the ventral side; external valve (third valvula) small, with about 8 very long setae.

Dimensions. Body length (in alcohol): 1·83 mm.

Coefficients of variability of the dimensions of characters given in Table V range from 4·4 (antenna) to 7·8 (first flagellar segment).

Table V.—*Length (in mm.) of various characters of* 25 *females of* P. fasciatus

	Mean	Standard deviation	Observed extremes
Fw	2·246	0·112	1·999–2·436
Hw	1·716	0·078	1·538–1·846
F	0·386	0·020	0·346–0·429
T	0·790	0·038	0·692–0·857
t_1	0·192	0·011	0·174–0·216
t_2	0·103	0·005	0·094–0·112
A	1·385	0·060	1·242–1·484
f_1	0·261	0·020	0·219–0·302
f_2	0·185	0·012	0·163–0·203
f_3	0·164	0·010	0·147–0·182
Ratio t_1/t_2	1·87	0·111	1·69 –2·08
Ratio f_1/f_2	1·41	0·064	1·29 –1·59

Male

Coloration (in alcohol, freshly killed). As the female, with the following exceptions: maxillary palpi dark brown; genae brown, with darker band from edge of eye to antennal socket; post-clypeus brown, with darker bands. Tibiae and tarsi dark brown. Abdomen almost colourless, apical sclerites dark brown.

Morphology.—Fore wing (fig. 14) relatively much broader distally and with a more prominent "lobe" at the marginal median cells; otherwise as female.

Number of ctenidibothria on first hind tarsal joint: 15–20 (8 specimens, average 17).

Genitalia (fig. 16): penial frame closed anteriorly; parameres fused posteriorly to form a short beak, and with one pair of fairly long, broad and slightly sclerotised internal arms (aedeagus) which meet along the mid-line. Penial complex ("radula" of Badonnel) composed of about 10 sclerotised bifid "hooks".

In one slide (fig. 17) the parameres are recurved antero-dorsally and the "radula" is moved posteriorly with the points of the bifid sclerites directed posteriorly; two pectinate sclerotised structures can be seen. This arrangement may be due to an accident of slide preparation, but is more probably the extruded condition of the male genitalia.

Table VI.—*Length (in mm.) of various characters of eight males of* P. fasciatus

	Mean	Standard deviation	Observed extremes
Fw . . .	2·122	0·124	1·923–2·333
Hw . . .	1·647	0·096	1·513–1·820
F . . .	0·372	0·023	0·341–0·418
T . . .	0·762	0·040	0·692–0·835
t_1 . . .	0·212	0·019	0·187–0·248
t_2 . . .	0·101	0·005	0·091–0·107
A . . .	1·730	0·137	1·528–1·973
f_1 . . .	0·291	0·027	0·240–0·329
f_2 . . .	0·233	0·024	0·195–0·270
f_3 . . .	0·208	0·020	0·171–0·232
Ratio t_1/t_2 . .	2·10	0·136	1·84 –2·33
Ratio f_1/f_2 . .	1·35	0·052	1·19 –1·35

Hong Kong Island: on *Pinus massoniana*, ix, xi, xii.57; i, ii, iii, iv.58, frequent.

Holotype ♀ and allotype ♂ retained in the author's collection. A male and a female paratype will be deposited in the British Museum (Nat. Hist.).

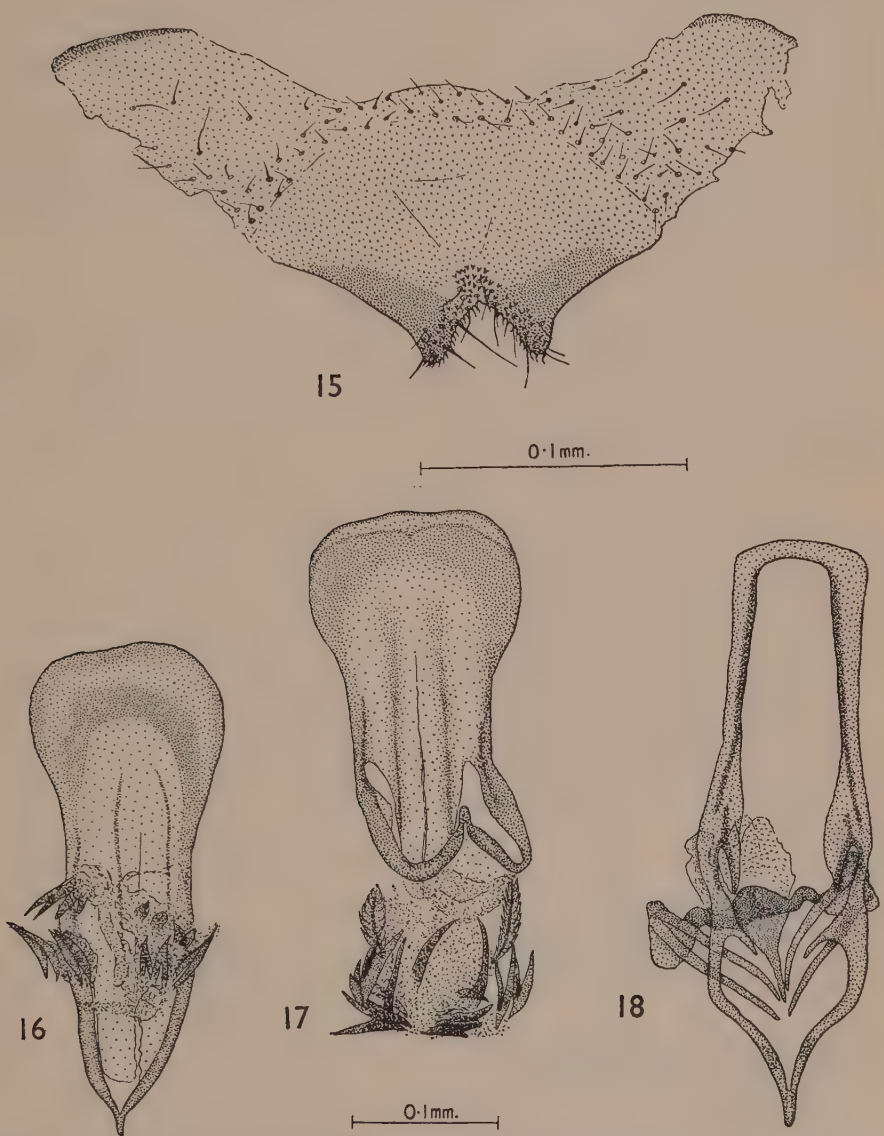
The ill-defined light transverse band across the fore wing is usually sufficient to distinguish this species from the other three. In lightly pigmented specimens, however, the bilobed subgenital plate with a small field of spines posteriorly is diagnostic for the female, while the bifid penial sclerites easily identify the male.

Remarks

The genus *Peripsocus* is fairly homogeneous, the most useful and reliable specific criteria being found after examination of the genitalia. Although wing pattern, where present, is often a useful character, venation is practically uniform within the genus. Slight variation in venation is found, but this has such a range within species that it must be considered unreliable as a specific character. The most useful characters for specific determination are, in the female, the shape and pattern of sclerotisation of the sub-genital plate, and, in the male, the shape and relationship of the parameres with the aedeagus, and the arrangements of the sclerites supporting the penial bulb.

Peripsocus similis and *P. fasciatus* are easily recognised by size and pattern of the fore wing. *P. spinosus* and *P. quercicola* are separable on the genitalia. In cases of slightly pigmented or fairly newly emerged specimens, some confusion may arise between *P. fasciatus* and *P. spinosus*, unless genitalia are examined, when both sexes are easily specified.

I have examined type specimens of *P. fulvescens* Navas and *P. reicherti*



FIGS. 15–18.—(15)–(17) *Peripsocus fasciatus* sp. n.: (15) Subgenital plate of female; (16) male phallosome; (17) male phallosome with penial complex extruded. (18) *P. spinosus* sp. n., male phallosome.

End., and specimens of *P. quercicola* End. determined by Enderlein. Study of the other species mentioned in the introduction has been limited to the original descriptions and figures. In most cases, the pattern of pigmentation of the fore wing has been sufficient to distinguish species from those in my collection, with the exceptions of *P. fulvescens* and *P. quercicola*, there being no information on genitalia for either of these species. Navas' description of the former is mainly concerned with venation, and the genitalia are not available for study. Accordingly, although it is possible that *P. spinosus* belongs to this species, I have described it as new. Dissection of the genitalia of a specimen of *P. quercicola* determined by Enderlein showed it to be identical with specimens collected in Hong Kong.

Summary

Two new species of the genus *Peripsocus*, namely *spinosus* and *fasciatus*, are described from Hong Kong Island, and further descriptions of the females of *P. similis* End., 1903 and *P. quercicola* End., 1906 are given.

Acknowledgments

I wish to thank Miss B. T. Chiu who identified the two trees, and Professor D. Barker who confirmed the colours of insect structures given in the specific descriptions. I am indebted to Mr. D. E. Kimmins of the Department of Entomology, British Museum (Natural History) for permission to dissect a specimen of *Peripsocus quercicola* End.

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TWO NEW SPECIES OF *TABANUS* L. (DIPTERA: TABANIDAE) FROM WEST AFRICA.

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Several thousand Tabanidae have recently been collected in Northern Nigeria from herds of Zebu cattle, and amongst the material obtained two new species of *Tabanus* L. have been found which are described in this paper. One of the new species was simultaneously collected in French West Africa by Dr. M. Ovazza, and this material has also been available for preparing the description.

Both new species belong in Oldroyd's (1954) patterned group of African *Tabanus*, and are superficially very similar to other species of this group. Patterned group species are often difficult to identify when only isolated specimens are available, but large series can usually be sorted into very convincing species; in general they are more easily separated by the unaided eye than by microscopical examination. Some species show considerable variation in colour and pattern, and these characteristics have been used rather too widely as specific or key characters; sometimes different colour patterns have been used for defining new species. But it is becoming clear that colour and pattern alone will not suffice as specific criteria if unsupported by structural characters, and that new species in the patterned group are likely to be unsound if the descriptions are based on only one or two specimens which may be no more than unusual colour or pattern variants of a known species.

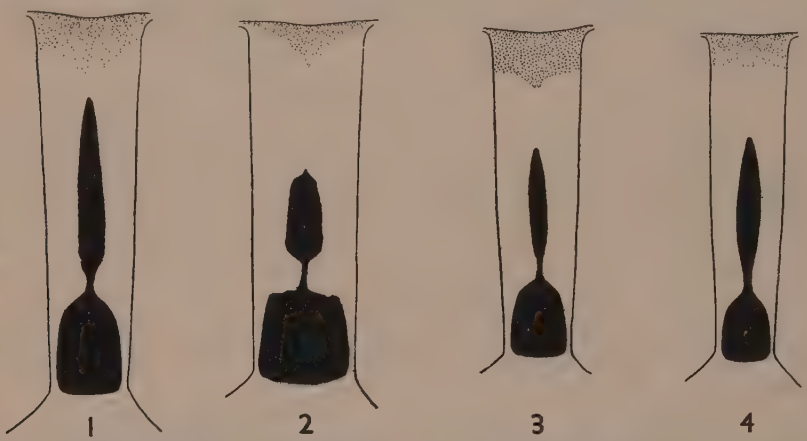
In the patterned group especially, even with two large series which one feels are specifically distinct, it is often difficult to find good morphological characters and the patterned group forms a difficult complex in a genus often notoriously lacking in good specific criteria. The best characters appear to lie, as usual, in the form and proportions of the female frons and calli, in the structure of the antennae, and in size, although colour and pattern remain useful for sorting by eye. Size is often particularly useful since, although there is a good deal of variation, two closely related species often vary in their *mean* dimensions, and large series of specimens are often very evidently of different size although the largest of the smaller group may overlap the smallest of the larger group.

In describing these two species I have emphasised measurements by giving the following dimensions:— body-length exclusive of antennae, wing-length, width of the frontal region at the vertex, and width of the frons at the subcallus. In all cases the number of specimens measured is shown in brackets, and the mean, maximum, minimum and standard deviation are given for each structure measured. All measurements given are in millimetres. Frons measurements were made with a screw-micrometer eyepiece with the head viewed antero-dorsally so that the rim of the occiput was just visible; width at the subcallus was measured along the suture between frons and subcallus, and width at the vertex was measured immediately below the angle of the eye.

Tabanus nigeriensis sp. n.

A patterned-group species superficially similar to *T. taeniola* Palisot de Beauvois but distinguished by the narrow frons and elongate calli (fig. 1), long third antennal segment with blunt dorsal projection (fig. 5), and brownish infuscations along the wing veins with a faint spot on the radial fork. Female only known.

Female.—Head. Eyes bare, purplish-brown without bands in life. Occiput yellowish-white, hairs white. Vertex usually with bare reddish-brown area of variable size, sometimes thinly tomented, hairs black. Frons (fig. 1) narrow, tapering strongly towards the subcallus, reddish-brown in ground colour with thick golden yellow tomentum, and mainly golden yellow hairs; usually also with a few erect black hairs; frons index: 4·5. Calli (fig. 1) red-brown or yellow-brown, lower callus higher than broad, separated by a tomented



Figs. 1–4.—Frons and calli of female of: (1) *Tabanus nigeriensis* sp. n.; (2) *T. taeniola* Palisot de Beauvois; (3) *T. ovazzai* sp. n.; (4) *T. quadrisignatus* Ricardo.

area from eye-margins; upper callus lance-shaped or fusiform, narrowly joined to the lower callus. Subcallus pale yellow. Face and parafacials white, tinged with yellow near the antennae, hairs white. Palpi pale yellowish-orange with mainly white hairs, and a variable number of black hairs; black hairs sometimes absent. Proboscis black. Antennae: first segment orange with white hairs and numerous black hairs dorsally, second segment orange-red with terminal fringe of black hairs; third segment elongate with blunt dorsal projection (fig. 5), reddish-orange, usually darkening apically and often with two or three incomplete blackish rings near the apex; terminal segments usually dark brown to black, sometimes red in specimens with reddish femora.

Thorax. Scutum with indistinct pattern, best seen by naked eye, of grey sublateral stripes, fine short median line, and side margins; ground colour of scutum reddish-brown laterally, dark brown in the centre, with greyish tomentum on the stripes and brown tomentum elsewhere; recumbent hairs of the scutum silky and pale yellow on sublateral stripes and lateral and anterior margins, with some silvery hairs on the median line; erect hairs black, numerous, and principally between sublateral stripes. Notopleural lobes reddish with long outstanding black hairs and a few silky recumbent yellow hairs near the scutum. Scutellum brown or dark reddish-brown with black hairs on the disc, and pale yellow hairs laterally which form a continuation of the sublateral scutal stripes on to the

scutellum ; marginal scutellar hairs pale yellow. Pleura pale grey, slightly orange on upper parts of mesopleura ; pleural hairs long, white, occasionally a few fine darker hairs on upper mesopleura.

Legs. Coxae grey or yellowish-grey with long white hairs. Femora dark grey or blackish, pale reddish-grey in specimens with median abdominal stripe constricted into triangles ; hairs white, with some shorter black hairs dorsally. Tibiae orange with white hairs except for apical third of fore tibia which is black with black hairs ; middle and hind tibiae with a few black hairs, principally apically. Tarsi black or reddish-black with black hairs and red spines ventrally ; tarsi dark red in specimens with reddish femora. Pulvilli red.

Wings. Faintly stained yellowish-brown with narrow darker infuscations along the veins, giving them a slightly thickened appearance to the naked eye ; usually a faint brown spot on the radial fork and sometimes heavier infuscation on cross-veins ; stigma yellow-brown ; vein R_4 without appendix. Halteres with dark orange or fuscous stalk, knob yellowish-orange to red-brown. Squamae yellowish-orange with fine white fringe hairs.

Abdomen. Dorsally with 3 conspicuous longitudinal stripes ; median stripe whitish or yellowish, usually nearly parallel-sided, sometimes broken into elongate triangles which reach the anterior margin of each tergite ; sublateral stripes orange or yellow, completely separated from the median stripe and generally clear-cut externally. Lateral margins of each tergite pale yellow. Ground colour of first 4 tergites light orange-brown to dark red-brown between median and sublateral stripes and between sublateral stripes and pale lateral margins ; ground colour of fifth to seventh tergites dark brown or black ; second tergite sometimes with faint greyish-black area underlying the median stripe on the anterior half. Sublateral stripes ending on fifth or sixth tergites, median stripe ending abruptly on hind margin of sixth tergite, seventh tergite therefore with pale side margins but without stripes. Hairs of the dorsum golden yellow on sublateral stripes, pale yellow on median stripe, long and white on lateral margins, and black on the dark areas between median and sublateral stripes and between sublateral stripes and pale lateral margins ; fringe hairs on posterior margins of tergites black on the darker areas, mostly yellow with a few black hairs on the pale stripes. Venter yellowish-orange laterally, reddish-brown to black in the median third ; hind margin of each sternite pale yellow ; hairs of the venter pale yellow on pale areas, black medially on the dark areas, posterior fringe hairs of each sternite pale yellow.

Measurements—

	Mean	Maximum	Minimum	Standard deviation
Body length (85) . . .	16·1	18·0	13·3	0·91
Wing length (30) . . .	14·3	15·9	12·4	0·78
Frons width at vertex (30) .	0·696	0·75	0·62	0·035
Frons width at subcallus (30) .	0·569	0·63	0·53	0·030

Male.—Unknown.

Material examined. *Type material.*—Holotype ♀, Northern Nigeria : Niger Province, Diko, 15.v.1957 (*R. W. Crosskey*), in British Museum (Natural History). Paratypes : Northern Nigeria : 13 ♀, Niger Province, Diko, 27.v.1956 (9 ♀), 19.v.1956 (1 ♀), 14.vi.1956 (1 ♀), 14.iv.1957 (1 ♀), 24.iv.1957 (1 ♀) (*R. W. Crosskey*) ; 1 ♀, Niger Province, Maje near Abuja, 9.v.1956 (*R. W. Crosskey*) ; 1 ♀, Nassarawa Province, Jemaa (now in Plateau Province), 24.iv.1907 (*R. F. Williams*) ; 1 ♀, Usai (? Province), 1912 (*A. C. Parsons*) ; 5 ♀, Zaria Province, Katabu, 17.v.1949 (1 ♀), 7.vi.1949 (3 ♀), 18.vi.1949 (1 ♀) (*F. L. Vanderplank*). Above paratypes all in collection of British Museum

(Natural History). Also 2 ♀ paratypes, Niger Province, Diko, 28.v.1956 (*R. W. Crosskey*) in collection of Service de Faunistique, I.D.E.R.T., Bondy, France.

Non-type material.—69 ♀, Northern Nigeria: Niger Province, Diko, 7.v–16.vi.1956, 14.iv–15.v.1957 (*R. W. Crosskey*); 1 ♀, Western Nigeria: Benin Province, Ekpoma, 16.iii.1956 (*M. A. Bird*).

Variation. As in *Tabanus taeniola* Palisot de Beauvois, the abdomen shows two patterns, a common pattern where the median line is a parallel-sided stripe and a less frequent pattern in which the median stripe is constricted into a series of elongate triangles; the common form with the linear median stripe corresponds to the typical form of *T. taeniola*, and the form with the serrate median stripe corresponds to form *variatus* Walker of *T. taeniola*. Specimens with the serrate median line have the femora brick-red instead of dark grey or blackish and the terminal antennal segments are generally dark red; the ground colour of the abdominal tergites is also paler than it is in specimens with the parallel-sided median stripe. Minor variation in colouring occurs in the antennae; most specimens show two or three incomplete blackish rings apically on the third segment, but the third segment is sometimes unicolorous orange and sometimes darkens evenly towards the apex. There is only very slight variation in the form of the frontal calli and the antennal segments, the frons is of very constant proportions but the vertex may be bare or lightly tomented.

Affinities. Tabanus nigeriensis is a species of the medium-sized patterned-group, closely related to *T. taeniola* P. de B. and showing some similarity to *T. fraternus* Walker; it fits into Oldroyd's (1954) *taeniola-fraternus* sub-group, G_3. Although superficially very similar to *T. taeniola* it is readily distinguished by the much narrower, tapering frons (*cf.* figs. 1 and 2) with its golden yellow instead of white tomentum, by the elongate calli (fig. 1), by the longer third antennal segment with blunter dorsal process (*cf.* figs. 5 and 8), and by the tinted yellowish-brown wings in which brownish suffusions along the veins give them a thickened appearance to the naked eye; there is a small pale brown spot on the radial fork (absent in *T. taeniola* in which the wings are clear). Minor differences occur in colour pattern; the abdominal coloration is much richer than in *taeniola* and the sublateral stripes are clearly demarcated laterally; the scutellum is evenly dark brown or red-brown without the brick-red tip as in *T. taeniola*, and the palpi are very pale orange (white in *taeniola*); the first antennal segment is orange instead of whitish, and the pale hairs of the scutum and abdominal tergites are golden instead of yellowish-white; the basal lateral corners of the abdomen are entirely yellow or pale orange, without the grey patch present in *T. taeniola*; the hairs of the upper mesopleura are white, without the intermingling of black hairs as in *taeniola*. The wings of *T. nigeriensis* resemble those of *T. fraternus* with less infuscation on the veins, but the abdominal pattern and form of the frons and calli clearly differentiate it from *T. fraternus*; in the latter species the frons is very broad and nearly parallel-sided as in *taeniola*, with a frons index of 3·5, and the median abdominal line of triangles ends abruptly on the fifth tergite instead of the sixth as in *T. nigeriensis*. It may be remarked that *T. taeniola* and *T. fraternus* are evidently very closely allied and the frons and calli are almost identical in the two species;

it seems possible that the two are not in fact specifically distinct. Both are, however, clearly different from *T. nigeriensis* in which the frons is narrow and tapering with a frons index of 4·5, instead of 3·5 as in *taeniola* and *fraternus*.

Distribution and habits.—*T. nigeriensis* appears to be a local species from Nigeria, since all the material seen (94 specimens) has been from Niger, Zaria and Plateau Provinces of Northern Nigeria with one specimen from Benin Province, Western Nigeria. The specimens from Katabu, Jemaa and Usai were found in the British Museum collection under the name of *T. taeniola* P. de B.; because of the close superficial likeness of *T. nigeriensis* to *T. taeniola* all the material of the latter species in the British Museum, consisting of over 800 specimens from all parts of Africa, was examined, but only the seven specimens of this new species from Katabu, Jemaa and Usai were found.

All the localities at which this species has so far been taken lie in the area of the Guinea savannah vegetation zone where there are either relict patches of forest (Diko, Maje, and Jemaa localities) or fringing forest along stream banks (Katabu). The latter locality lies 15 miles N.N.E. of Kaduna, and not 15 miles E. of Kaduna as printed on the data labels attached to the five Katabu paratypes. The type locality, Diko, lies nine miles north of Abuja, Niger Province, at 9° 17′ N. and 7° 12′ E. A total of 86 specimens of *T. nigeriensis* was taken by the author at this locality between April and June, 1956 and 1957 ; the other material seen was also collected in April, May and June, and *T. nigeriensis* is evidently a species with a short two-month flight season at the end of the dry season and in the early rains. The specimen from Ekpoma was collected in March, but this locality lies further south than the others on the fringe of the Benin forest where the wet season begins earlier. Among the Diko series of material the earliest flight date recorded was 14th April, and the latest 16th June.

The 86 specimens taken at Diko were almost all collected on cattle, a few on horses, and two in a car ; none were found biting man.

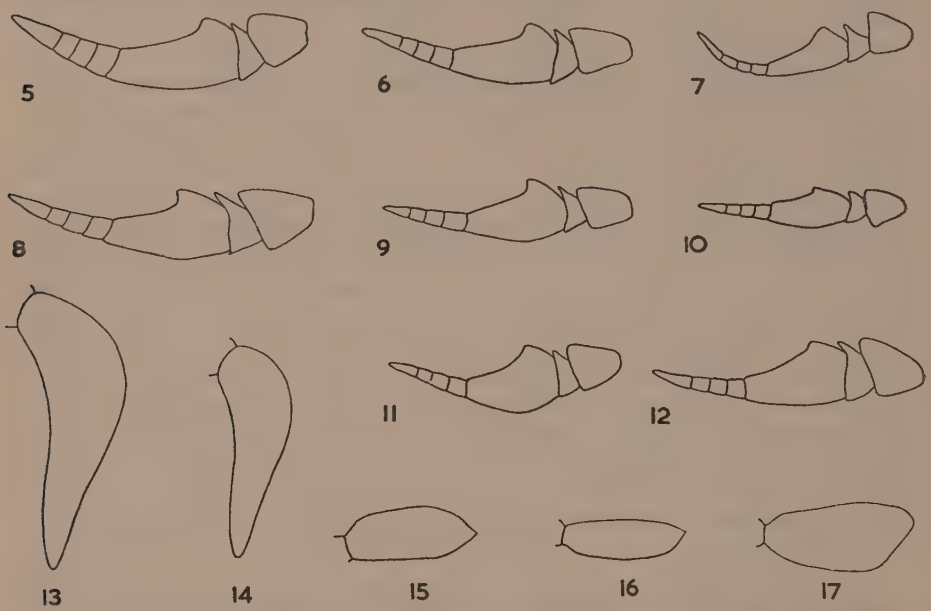
Specimens in which the median abdominal stripe is in the form of triangles or at least somewhat serrate were all collected in April or very early May, before the wet season had begun ; it has been noticed with *T. taeniola* also that specimens with median triangles (forms *variatus* Walker and *sagittarius* Macquart) occur mostly in the dry season, and it seems possible that seasonal polymorphism exists in this and related species.

Tabanus ovazzai sp. n.

A small species of the chocolate-brown patterned group with three rows of straw-coloured abdominal triangles, similar to *T. distinctus* Ricardo but distinguished by the elongate antennae (figs. 6 and 7), narrower frons, small median abdominal triangles, smaller size, and narrower palpi in the male (*cf.* figs. 15 and 17).

Female.—Head. Eyes bare, or occasionally with a few microscopic hairs, purplish-brown without bands in life. Occiput whitish with white hairs. Vertex with broad shining non-tomented area, usually traces of ocellar tubercle (fig. 3), hairs mostly black but usually some yellow hairs. Frons (fig. 3) moderately broad, slightly convergent towards the subcallus, red-brown in ground colour with thin white tomentum which is easily rubbed ; hairs on the frons pale yellowish-white with a few erect black hairs on

either side of the upper callus; frons index: 4·1. Calli (fig. 3) red-brown, lower callus higher than broad and well separated from eye-margins; upper callus lanceolate, clearly joined to lower callus. Subcallus pale yellowish-white. Face and parafacials white tinged with yellow on the upper parts of the parafacials near the subcallus, hairs white. Palpi pale yellowish-white with almost all white hairs, occasionally a few short black hairs apically. Proboscis blackish-brown. Antennae: first segment yellow with white tomentum and white hairs, black hairs dorsally and apically; second segment yellowish-orange with white fringe hairs internally, some black fringe hairs externally; third segment narrow and elongate with rounded, blunt, dorsal projection (fig. 6), orange basally darkening towards the apex; terminal segments dark brown or blackish.



Figs. 5–17.—(5–12) Antenna of: (5) *Tabanus nigeriensis* sp. n., ♀; (6) *T. ovazzai* sp. n., ♀; (7) *T. ovazzai*, ♂; (8) *T. taeniola* Palisot de Beauvois, ♀; (9) *T. quadrisignatus* Ricardo, ♀; (10) *T. quadrisignatus*, ♂; (11) *T. distinctus* Ricardo, ♀; (12) *T. distinctus*, ♂. (13–14) Lateral view of palp of female of: (13) *T. nigeriensis*; (14) *T. ovazzai*. (15–17) Ventral view of palp of male of: (15) *T. ovazzai*; (16) *T. quadrisignatus*; (17) *T. distinctus*.

Thorax. Scutum with distinct pattern of well marked grey sublateral stripes and side margins, and sometimes with short fine grey median line, pattern best seen by naked eye and often more apparent in rubbed specimens with little pubescence; ground colour dark brown, with ash-grey sublateral stripes, lateral margins, and anterior border including median line; sometimes reddish in old specimens; scutum thickly clothed with hairs in unrubbed specimens, recumbent hairs mostly yellowish-white on the grey areas, black on dark brown areas; also with fine erect blackish hairs on both grey and brown areas. Notopleural lobes yellowish with long outstanding dark hairs and a few recumbent silver hairs near the scutum. Scutellum dark brown, sometimes with a reddish tinge, shading to ashy grey laterally; scutellar hairs sparse, black medially, a few long black hairs apically, long and silvery yellow laterally. Pleura pale grey, tinged with yellow on upper mesopleura, hairs white.

Legs. Coxae pale grey with white hair, procoxae tinged yellow basally and metacoxae slightly orange. Fore femora black or reddish-black in ground colour, bare and shining ventrally, with grey tomentum and white hairs laterally and dorsally; middle and hind femora orange-red or greyish-red with white hairs, hind femora often with some black hairs dorsally. Fore tibiae yellowish-orange basally, blackish on apical third, hairs white basally and black on dark areas; middle and hind tibiae orange with long white hairs, and some short spiny black hairs apically on the mid tibiae and dorsally on the hind tibiae. Fore tarsi black, middle and hind tarsi dark red or reddish-black, hairs black; middle and hind tarsi with red spines ventrally. Pulvilli yellow.

Wings. Clear, hyaline, without colour tinge, veins brown or yellow-brown; stigma pale yellowish; vein R_4 without appendix. Halteres with brown stalk and pale yellow knob. Squamae pale brown or brownish-yellow, fringe hairs white.

Abdomen. Dorsum with clearly marked complete pattern consisting of median row of small narrow triangles and sublateral rows of right-angled triangles with the right-angles inwards or quadrilateral spots; median triangles elongate reaching the anterior margin of the tergite, sometimes slightly broadened basally but always widely separated from sublateral spots; sublateral spots sometimes not reaching the anterior margins of the tergites giving the sublateral stripes a broken appearance; median triangles and sublateral spots usually straw-coloured or pale coffee-coloured, sublateral spots slightly darker than the median spots: ground colour of the tergites chocolate-brown, only darkening slightly towards the apex of the abdomen, occasionally chestnut-brown basally and almost black apically; extreme lateral margins of the tergites greyish-yellow on the basal segments, becoming golden on the fifth and sixth tergites; seventh tergite yellow laterally and apically, without spots, spots of the median and sublateral rows ending on the sixth tergite. Hairs of the dorsum black on the dark areas of the tergites, white on the spots and posterior and lateral margins. Venter orange darkening to blackish apically, with short fine recumbent white hairs.

Measurements—

	Mean	Maximum	Minimum	Standard deviation
Body length (50) . . .	12·5	14·2	10·9	0·78
Wing length (30) . . .	10·5	11·9	8·8	0·76
Frons width at vertex (30) .	0·549	0·66	0·47	0·041
Frons width at subcallus (30) .	0·443	0·49	0·39	0·026

Male.—Generally similar to the female except for the usual sexual differences. Eyes (pinned material) with area of small facets blackish-brown, area of large facets pale yellow with purplish-brown area dorso-centrally which meets that of the opposite eye; subcallus with white tomentum and bare yellow-brown dorsal apex; tomentum of face and parafacials white; palpi (fig. 15) almost parallel-sided, acuminate at the apex, pale yellow with white hairs; antennae (fig. 7) thin and elongate, third segment narrow with blunt triangular dorsal projection, terminal segments very elongate. Femora reddish-black. Abdominal pattern similar to female. Measurements (2 specimens): body length 14·5, 13·7; wing length 11·6, 11·1.

Material examined. *Type material.*—Holotype ♀, Northern Nigeria: Niger Province, Diko, 5.ii.1957 (*R. W. Crosskey*), in British Museum (Natural History). Paratypes: Northern Nigeria: 12 ♀, Niger Province, Diko, 15.xii.1956 (1 ♀), 2.i.1957 (1 ♀), 5.ii.1957 (3 ♀), 7.ii.1957 (2 ♀), 9.ii.1957 (3 ♀), 20.ii.1957 (1 ♀), 10.iii.1957 (1 ♀) (*R. W. Crosskey*); 1 ♂, Zaria Province, Kaduna, 14.i.1955; 1 ♀, Zaria Province, Giwa, 28.ii.1955; 1 ♀, Zaria Province, Karau-Karau, 28.ii.1957; 2 ♀, Zaria Province, Kidandan, 24.ii.1955; 1 ♀,

Zaria Province, Katabu, 23.ii.1957 (*R. W. Crosskey*). WESTERN NIGERIA: 3 ♀, Benin Province, Ekpoma, 20.i.1956 (2 ♀), 23.iii.1956 (1 ♀) (*M. A. Bird*). TOGOLAND (exact location not traceable): 1 ♀, Depoi, 24.i.1917 (*J. J. Simpson*). GHANA: 1 ♀, Northern Territories, Brumase, 1910 (*F. J. A. Beringer*); 1 ♀, Northern Territories, road between Palbo and Palabuso, 27.ii.1910 (*F. J. A. Beringer*); 1 ♂, Northern Territories, Makongo, ii.1916 (*J. J. Simpson*). FRENCH WEST AFRICA: 1 ♀, Soudan, Bougouni District, Mamissa, 29.i.1956; 2 ♀, Upper Volta, Bobo District, Badama village, 8.ii.1957; 1 ♀, Upper Volta, Bobo District, Séguéré, 12.ii.1956 (*M. Ovazza*); 2 ♀, Upper Volta, Bobo District, Séguéré, 12.ii.1957 (1 ♀), 8.iii.1957 (1 ♀) (*M. Ovazza*). Last six paratypes from French West Africa in the collection of Service de Faunistique, I.D.E.R.T., Bondy, France; other paratypes all in British Museum (Natural History).

Non-type material.—101 ♀, NORTHERN NIGERIA, Niger Province, Diko, 15.xii.1956–12.iii.1957 (*R. W. Crosskey*); 2 ♀, Zaria Province, Kidandan, iv.1955; 1 ♀, WESTERN NIGERIA, Benin Province, Ekpoma, 23.iii.1956 (*M. A. Bird*).

Variation.—As with most species there is some variation in size, but pattern and colour are remarkably uniform; there is slight variation in size of the median abdominal triangles and in some specimens the ground colour of the tergites is light reddish-brown instead of the usual chocolate-brown; the sublateral abdominal spots are occasionally slightly orange.

Affinities.—*T. ovazzai* sp. n. appears to be most closely related to *T. distinctus* Ricardo, but also shows considerable affinity with *T. quadrisignatus* Ricardo. The abdominal pattern resembles that in both these species, but the coloration is similar to *T. distinctus*. It is distinguished from *T. distinctus* by the narrower frons, the differently shaped antennae (*cf.* figs. 6 and 11, and figs. 7 and 12) and by the smaller size (mean length 12·5 mm. compared with a mean length of 14·4 mm. in *T. distinctus*, of which 24 specimens have been measured ranging from 13·0–16·0 mm.). It also differs from *T. distinctus* in the shape of the abdominal spots: in *T. ovazzai* the median triangles are elongate and widely separated from the sublateral spots, and the sublateral spots are usually trapezoidal or irregular not tapering to a point anteriorly; in *T. distinctus* the median triangles are almost equilateral and their hind angles reach or almost reach the sublateral spots, and the sublateral spots are regular right-angled triangles produced to a point anteriorly. The scutal pattern is less boldly marked than in *T. distinctus* and the scutellum is brown or blackish without the orange-red apex of *distinctus*.

From *T. quadrisignatus* this species may be distinguished by the broader frons (*cf.* figs. 3 and 4) with an index of 4·1 instead of 4·6, by the smaller upper callus, and by the predominantly brown instead of orange coloration; the sublateral scutal stripes are grey and less bold than the yellow stripes of *quadrisignatus*, the median abdominal triangles are straw-coloured instead of yellow, and the sublateral abdominal spots pale coffee-brown instead of orange. The ground colour of the abdominal tergites is chocolate-brown in *T. ovazzai* and orange-brown in *T. quadrisignatus*, and the wings are colourless without the yellow tinge of *quadrisignatus*. The third antennal segment is longer and narrower than in *quadrisignatus* with a less prominent dorsal projection (*cf.* figs. 6 and 9, and figs. 7 and 10). The middle and hind femora in *T. ovazzai*

are reddish-grey or dark orange-grey and darker than the tibiae, but in *T. quadrisignatus* they are yellowish-orange and almost concolorous with the tibiae.

This species differs from *T. kwiluensis* Oldroyd in the much narrower frons and the grey instead of bold yellow scutal stripes.

Distribution and habits.—This new species is evidently principally found in the savannah areas of West Africa, for the 136 specimens seen have been collected in Nigeria, French Upper Volta, French Sudan, Ghana (Gold Coast) and Togoland. The type locality lies in an area of secondary Guinea savannah with small patches of scattered forest ; the localities in Zaria Province lie between 10° and 11° N. in savannah with light fringing forest along watercourses, and the Ghana localities probably lie in similar country. One of the Ghana specimens was collected at Brumase (8° 21′ N., 0° 58′ W.) and another is labelled " road between Palbo and Palabuso ". There seems no doubt that the latter places must be Palbe and Palbusi which lie at 9° 05′ N., 0° 35′ W. and 9° 01′ N., 0° 32′ W. respectively. The other Ghana locality, Makongo, cannot be traced but is probably Makono (8° 20′ N., 0° 37′ W.). The locality called Depoi in Togoland cannot be traced and it is not known whether it is in Ghana Togoland or French Togoland. The specimens from French West Africa were collected in dry savannah with nearby swamps north of 11° N.; the positions of the localities are : — Mamissa 11° 27′ N., 7° 30′ W.; Badama 11° 33′ N., 4° 22′ W.; Séguéré 11° 28′ N., 4° 27′ W.

T. ovazzai is a dry season species occurring from December to March, and abundant principally in January and February ; in the series of 114 specimens collected by the author at Diko, Northern Nigeria, the earliest date recorded was 15th December and the latest 12th March, but two specimens have been seen from Ekpoma, Benin Province, which were collected on 23rd March. These two specimens were collected from cattle grazing in a savannah patch amongst forest.

All the Diko material was also collected from cattle, and there is no evidence that the species bites man.

Acknowledgments

I am greatly indebted to Mr. H. Oldroyd, British Museum (Natural History), for much helpful discussion and use of the British Museum collection ; to Dr. M. Ovazza for use of his material ; to Dr. D. R. Ragge for the use of a screw-micrometer eyepiece ; and to the Government of Northern Nigeria for permission to publish this paper.

Reference

Oldroyd, H., 1954, *The horse-flies* (*Diptera : Tabanidae*) *of the Ethiopian Region. Vol. II.* British Museum (Nat. Hist.), London.

A NEW *AEROPEDELLUS* (ORTHOPTERA : ACRIDIDAE) FROM TURKEY

By T. Karabag

(*Zoological Institute, Ankara, Turkey*)

During my journey to the mountains on the southern coast of the Black Sea in 1956 I collected many interesting Orthoptera which are deposited in the Zoological Institute of the University of Ankara.

This region is specially interesting, because this range of mountains (Tatos Dag) is a continuation of the Caucasus. Along the range I collected many *Gomphocerus sibiricus acutus* Karabag, but there were no *Gomphocerus* in the area where the new *Aeropedellus* was found.

This boreal genus is now recorded for the first time in NE. Anatolia. Another species, *A. variegatus*, was recorded by Fischer-Waldheim in 1846 (*Orth. Imp. Rossici*) from E. Siberia and the Caucasus ; the latter record, however, is very doubtful, since it is known that Fischer-Waldheim wrongly recorded several Siberian species as occurring in the Caucasus. Tarbinsky (1931, *Bull. Inst. Contr. Pests Leningr.* **1** : 144) quoted this species from Mirskaya in N. Caucasus, but did not comment on the fact that it was the only Caucasian record, all others being from Siberia. It therefore remains uncertain whether *A. variegatus* occurs in the Caucasus and, if it does, by which of the five known subspecies (all Asiatic) it is there represented. Bei-Bienko and Mistshenko (1951, *Saranch. Fauna SSSR.* **2** : 492) include the Caucasian record under *A. variegatus variegatus* (F.-W.), but their action is not supported by any evidence.

The Turkish species is much larger than *A. variegatus* and similar in this respect to *A. reuteri* (Miram) from E. Siberia, but it differs from the latter in the shape of the pronotal carinae and in the very wide tarsal arolia.

Aeropedellus turcicus sp. n. (Figs. 1–9)

Male (*type*).—Antenna longer than head and pronotum together, its apex with a long and broad clavus (fig. 1) ; frontal ridge in profile prominent above the antenna (fig. 2), weakly convex in profile (fig. 3) ; fastigium of vertex projecting forward (fig. 2), triangular, its apex acute ; temporal foveolae long, regularly curved.

Pronotum slightly convex in the prozona, median carina well developed, almost straight in profile (fig. 3) ; lateral carinae well developed (figs. 2, 3).

Elytron (fig. 4) short, extending almost to end of body ; wing much shorter than elytron.

Anterior femur weakly inflated ; anterior tibia (fig. 5) approximately as long as femur, scarcely inflated ; tarsal arolium wide (fig. 6).

General coloration dirty olive-greenish, elytra, legs and lower surface of body light brown ; ast tibia light red.

Female.—Larger than male ; antenna longer than head and pronotum together, its apex weakly clavate and flattened ; frontal ridge almost straight in profile (fig. 7) ; fastigium of vertex triangular, its apex not acute (fig. 8) ; temporal foveolae shorter than in male, very weakly curved.

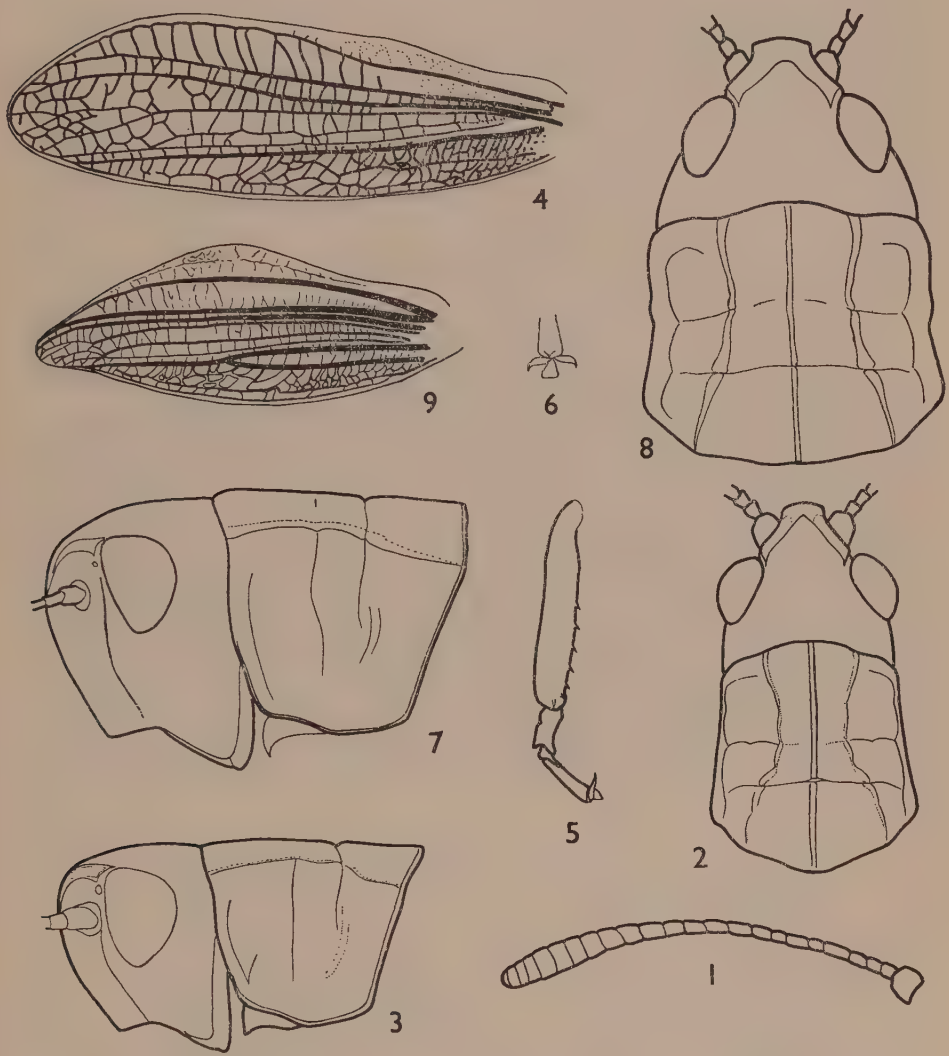
Pronotum thick (fig. 8), median carina well developed, almost straight in profile (fig. 7); lateral carinae well developed (figs. 7, 8).

Elytron (fig. 9) much shorter than in male; its apex acute, extending almost to fourth abdominal tergite.

Anterior femur not inflated; anterior tibia shorter than in male.

General coloration as in male.

Measurements: length of body, ♂ 16·1 (type)—17, ♀ 20·2–21·8; antenna, ♂ 7·2 (type)—7·6, ♀ 6·3–6·9; pronotum, ♂ 3·9 (type)—4, ♀ 5·9–7·1; elytra, ♂ 9·2 (type)—9·3,



FIGS. 1–9.—*Aeropedellus turcicus* sp. n. *Male:* (1) Left antenna; (2) head and pronotum from above; (3) head and pronotum in profile; (4) left elytron; (5) anterior left tibia and tarsus; (6) anterior tarsal arolium. *Female:* (7) Head and pronotum in profile; (8) head and pronotum from above; (9) left elytron.

♀ 5·7–7·2 ; anterior tibia, ♂ 3·3 (type)—3·6, ♀ 2·8–3·1 ; hind femur, ♂ 9·6 (type)—10·3, ♀ 11·4–12·1 mm.

TURKEY : Trabzon, Zigana dagi, 2500 m., 4.ix.1956, 11 ♂ (including type), 19 ♀ (*T. Karabag*).

The type and some paratypes are deposited in the British Museum (Natural History) ; other paratypes in the Zoological Institute, University of Ankara.

BOOK NOTICE

University of California Publications in Entomology.

Vol. 14, No. 5. A revisional study of the bees in the genus *Perdita* F. Smith (Hym., Apoidea), Pt. III. By P. H. TIMBERLAKE. Pp. 304–410, text illust. 8vo. Berkeley and Los Angeles. Price $2.00.

Vol. 15. Monographic study of the genus *Nomadopsis* Ashmead (Hym., Andrenidae). By J. G. ROZEN. Pp. 202, text illust. 8vo. Berkeley and Los Angeles, 1958. Price $4.00.

The above two monographic studies are among the most recent additions in the *University of California Publications in Entomology*.

The first work, which is the final part in a series of revisional studies on the genus *Perdita*, gives a detailed systematic revision of the typical subgenus, with supplementary information on the subgenera dealt with in the two previous parts, Vol. 9, No. 6, and Vol. 11, No. 5, in this series.

The second work is a comprehensive study of the North American bee genus *Nomadopsis*, in which the biology, distribution and systematics are dealt with and the latter characters evaluated in the light of their adaptive significance.

FOUR NEW SPECIES OF KALOTERMITIDAE FROM EAST AFRICA (ISOPTERA)

By W. Wilkinson
(*Colonial Termite Research Unit*)

Four new species are described—*Kalotermes sylvaticus*, *Kalotermes angulatus*, *Neotermes aridus* and *Glyptotermes ignotus*.

The preparation of a revision of the East African Kalotermitidae based on the extensive collection of the Termite Research Unit confirms that the degree of variability in some species is very great, particularly in those with wide distribution. Many forms have been examined which might, taken individually, be classed as new species. A reasonable interpretation of variation and consideration of ecological factors enable most of them to be included in known species. New termites have often been described from inadequate material, differing only in slight particulars from those already known. This has resulted in a number of species which can be neither verified nor synonymised by other workers, particularly if the specimens are not readily available. On the other hand, to attribute termites in error to established species leads to a false picture of their distribution. When publication of doubtful material is essential it is suggested that it be described as " near " the species concerned, and accompanied by comparative data and careful illustrations.

Kalotermes sylvaticus sp. n.

Imago (fig. 1, *A—E*).—Head capsule medium yellow-brown, paler beneath, shining but faintly reticulate ; setae sparse, small and inconspicuous, with scattered larger bristles up to 0·2 mm. long ; lateral arms of epicranial suture dark brown. Eyes black ; small and very convex. Ocelli almost white ; broadly oval, touching eyes. Antennae pale yellow-brown, segment 3 darker ; 15–18 segmented, mostly 16 ; segments 4–6 quadrate, the rest increasingly elongate, but not more than one-third longer than broad ; terminal segment smaller than penultimate. Labrum pale yellow-brown ; front margin arcuate. Mandibles as figured.

Pronotum colour and setae as head ; shaped as figured, sides diverging posteriorly before turning in sharply to hind margin ; about as broad as head. Meso- and metascuta pale yellow-brown, posterior margins and sagittal lines darker. Wings hyaline, slightly iridescent, scale, base, costa and radial sector sepia-brown ; membrane very indistinctly papillate, covered with evenly scattered minute granules ; venation of *Kalotermes* pattern. Legs pallid, tibiae darker, setae, apical spines and tips of claws brown. Abdominal tergites same colour as head, with marginal setae ; sternites paler.

	Mean (mm.)	Range (mm.)
Length of head to front angles	1·14	1·06–1·19
Width of head across eyes	1·28	1·25–1·35
Length of ocellus	0·14	0·11–0·16
Width of ocellus	0·11	0·09–0·13
Greatest diameter of eye	0·37	0·34–0·40
Maximum length of pronotum	0·87	0·81–0·95
Maximum width of pronotum	1·31	1·21–1·43
Length of fore wing	11·0	10·0–11·9
Width of fore wing	3·1	2·8–3·3
Length of hind tibia	1·05	0·99–1·09

Described from 36 specimens (20 measured, 10 from Uganda, 10 from Kenya) from 2 colonies.

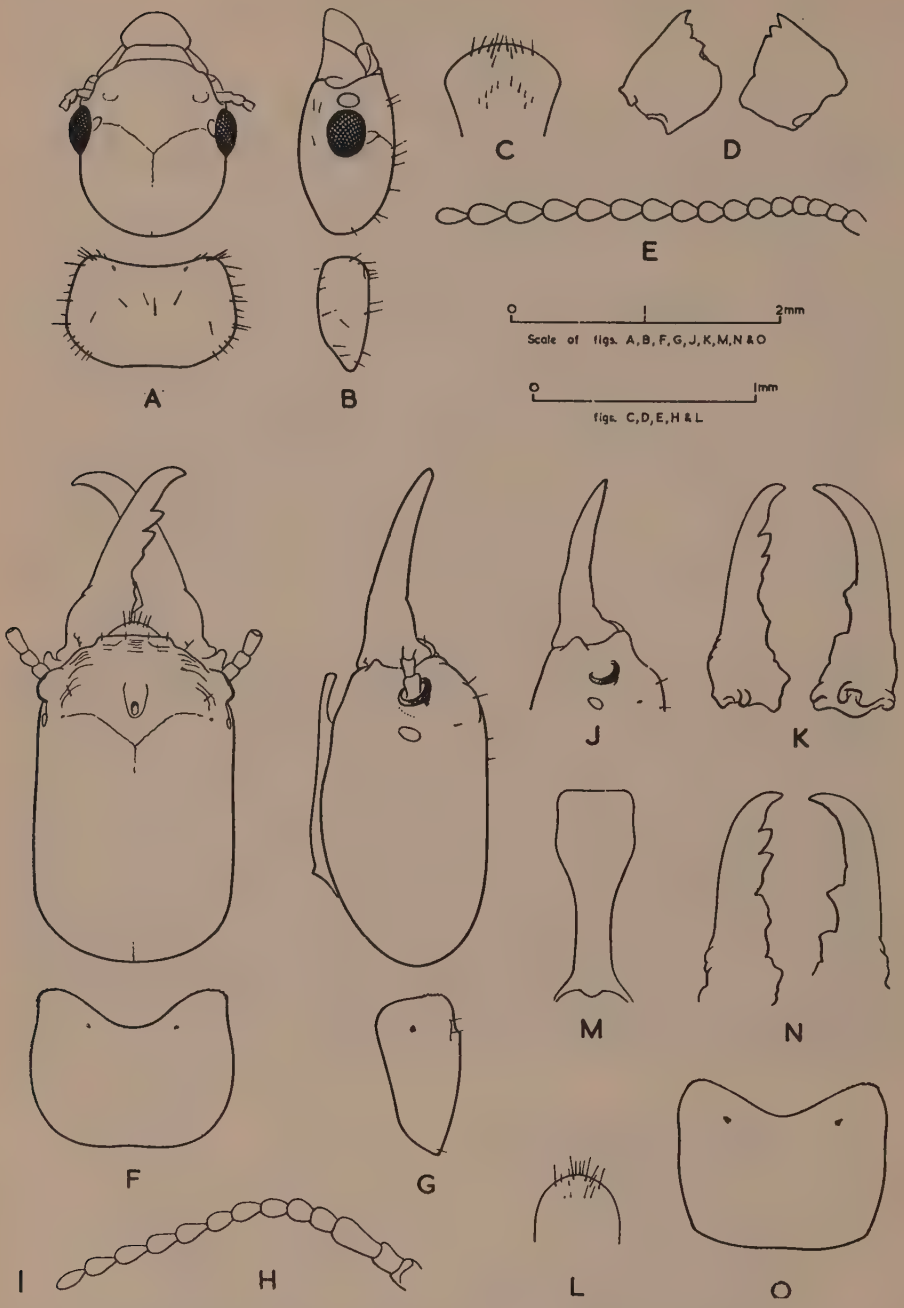


FIG. 1.—*Kalotermes sylvaticus* sp. n. *A–E*, Imago: *A*, head and pronotum from above; *B*, head and pronotum from side; *C*, labrum; *D*, mandibles; *E*, antenna. *F–O*, Soldier: *F*, head and pronotum from above; *G*, head and pronotum from side; *H*, antenna; *J*, variant slope of frons; *K*, mandibles; *L*, labrum; *M*, postmentum; *N*, mandibles of a Kenya specimen; *O*, pronotum of a Kenya specimen.

Soldier (fig. 1, *F–O*).—Head capsule pale red-brown, frons red-brown to black, or this colour spreading halfway towards back of head ; anterior third of capsule dull, very finely and closely granulate, remainder extremely finely granulate ; setae very small and sparse. Frons steep, flat, lightly transversely ridged ; latero-frontal swellings prominent, separated by small oval depression (" fontanelle "). Eyes pallid ; not convex. Ocelli sometimes visible as pale streaks. Antennae red-brown, becoming paler distally ; 12–14 segmented, mostly 13 ; third segment clavate, one and a half times to twice as long as second. Labrum red-brown, slightly transverse, evenly rounded. Postmentum red-brown, variably darker towards front ; broad anterior part parallel-sided or slightly rounded, about one-third length of whole and twice as broad as waist. Mandibles black, dark chestnut at base ; shaped as figured.

Pronotum cream to pale red-brown, darker at front ; finely reticulate ; setae small, sparse ; front edge deeply emarginate, roughened, becoming finely serrate on antero-lateral corners, which project forwards and upwards ; sides more or less rounded, hind edge straight or with slight median emargination ; about as broad as head. Remainder of body and legs pallid to yellowish, tips of tibial spines and claws red-brown.

	Mean (mm.)	Range (mm.)
Length of head to front angles . .	2·18	1·97–2·45
Maximum head width . . .	1·41	1·28–1·54
Width of head at front angles . .	1·29	1·17–1·43
Maximum head depth . . .	1·19	1·09–1·32
Length of left mandible . . .	1·57	1·46–1·68
Maximum length of pronotum . .	1·00	0·85–1·23
Maximum width of pronotum . .	1·37	1·21–1·59
Length of hind tibia	0·99	0·91–1·17

Described from 12 specimens (all measured) from 4 colonies.

Relationships.—A number of similarities show *K. sylvaticus* to have affinities with the *K. mutubae* group, but points of difference suggest the species to have been established before the main stock split into its present species complex.

The alate in its colour and small eyes resembles that of *mutubae*. It differs most obviously in the posteriorly diverging and angled sides of the pronotum, constant in all the specimens examined. The small setae of the head and pronotum are larger and more numerous, but the bristles not as long or conspicuous, so that the difference between the two sizes is not great. Compared with those of its congeners the wings are shining and clear, yet strongly and distinctly veined, and are also large in relation to head size.

The long, deep head capsule of the soldier, with distinct latero-frontal bulges is somewhat like that of the *mutubae* group, but its dark front and denser granulation serve as a first separation factor. The mandibles, though long, are not straight, lack prominent outer basal swellings, and in dentition are rather nearer to *durbanensis*.

Material.—Holotype : alate female. Allotype : alate male. Morphotype : soldier. British Museum (Natural History).

Type colony.—Uganda : Ankole District, 8 miles south of Kichwamba, 5,000 feet. Tall forest with thick undergrowth. In sound, dead base of *Ficus dawei*. 10.ii.1955 (*WW.* 265).

Other records.—Kenya : Meru, ii.1952 (*W. V. Harris* 816) ; ii.1953 (*W. A. Sands* 401) ; i.1954 (*J. C. M. Gardner* R.34).

Bionomics

Distribution.—*K. sylvaticus* is known only from Western Uganda and the slopes of Mount Kenya. It appears to be a forest-dweller, and is likely to live also in the Congo and in patches of relict upland and montane forest elsewhere in East Africa. The Kenya soldiers so far known differ from the type colony in having a straighter-sided pronotum with less obvious serration, but no subdivision on these grounds is proposed.

Host trees.—Recorded from *Ficus dawei* and *Olea welwitschi.*

Workings.—Very long, fairly narrow chambers, showing little tendency to coalesce; in hard, sound, dead tree trunks.

Alate production.—Mature winged reproductives were found in the colonies taken in Kenya in January and Uganda in February.

Kalotermes angulatus sp. n.

Imago (fig. 2, *A–E*).—Head capsule red-brown; shining, lightly reticulate, sometimes finely granulate towards front; setae sparse, minute; often a bristle behind each eye and one on epicranial plate. Eyes black; somewhat pyriform due to extension along gena, small and very convex. Ocelli white; round or short oval; separated from eyes by about half their own width. Antennae medium brown throughout; 15 to 18 segmented, mostly 16; third segment in most instances slightly longer than second, fourth and fifth transverse, remainder becoming almost globular, terminal smallest. Labrum pale brown, front margin straight or arcuate. Mandibles as figured.

Pronotum darker than head, chestnut to dark brown; a marginal fringe of small setae, and several prominent bristles up to 0·3 mm. long, there being normally on each half one on front, four on side and one on hind margins, also two to four forming a transverse central row or U; broad, sides well-rounded. Meso-and metascuta red-brown. Wings brown, iridescent, scale, base, costa and radial sector dark chestnut-brown; membrane closely and coarsely papillate; papillae topped by brown spurs or rugosities; rather short, costal margin almost straight; *Kalotermes*-pattern venation. Remainder of thoracic plates red-brown; femora brown; tibiae and first three tarsal segments almost white; claws, claw segment and tibial spurs darker. Abdomen red-brown, somewhat paler beneath, with long setae.

	Mean (mm.)	Range (mm.)
Length of head to front angles	1·22	1·13–1·32
Width of head across eyes	1·36	1·25–1·50
Length of ocellus	0·12	0·10–0·15
Width of ocellus	0·10	0·08–0·11
Distance between ocellus and eye	0·04	0·02–0·06
Greatest diameter of eye	0·36	0·34–0·41
Maximum length of pronotum	1·00	0·88–1·17
Maximum width of pronotum	1·47	1·32–1·68
Length of fore wing	7·8	7·2 –8·8
Width of fore wing	2·0	1·8 –2·3
Length of hind tibia	1·15	1·02–1·25

Described from 35 specimens (20 measured) from 8 colonies.

Soldier (fig. 2, *F–O*).—Head capsule pale red-brown, somewhat darker anteriorly; shining, extremely finely granulate, more closely towards front; setae small and few in number. Frons moderately steep; some light transverse ridging toward clypeus; medial area just in front of epicranial suture sometimes hollowed and longitudinally striate, in extreme cases forming an oval depression with concentric striae; marked latero-frontal swellings, sometimes bearing tubercules anterior to ocelli. Eyes large but poorly defined.

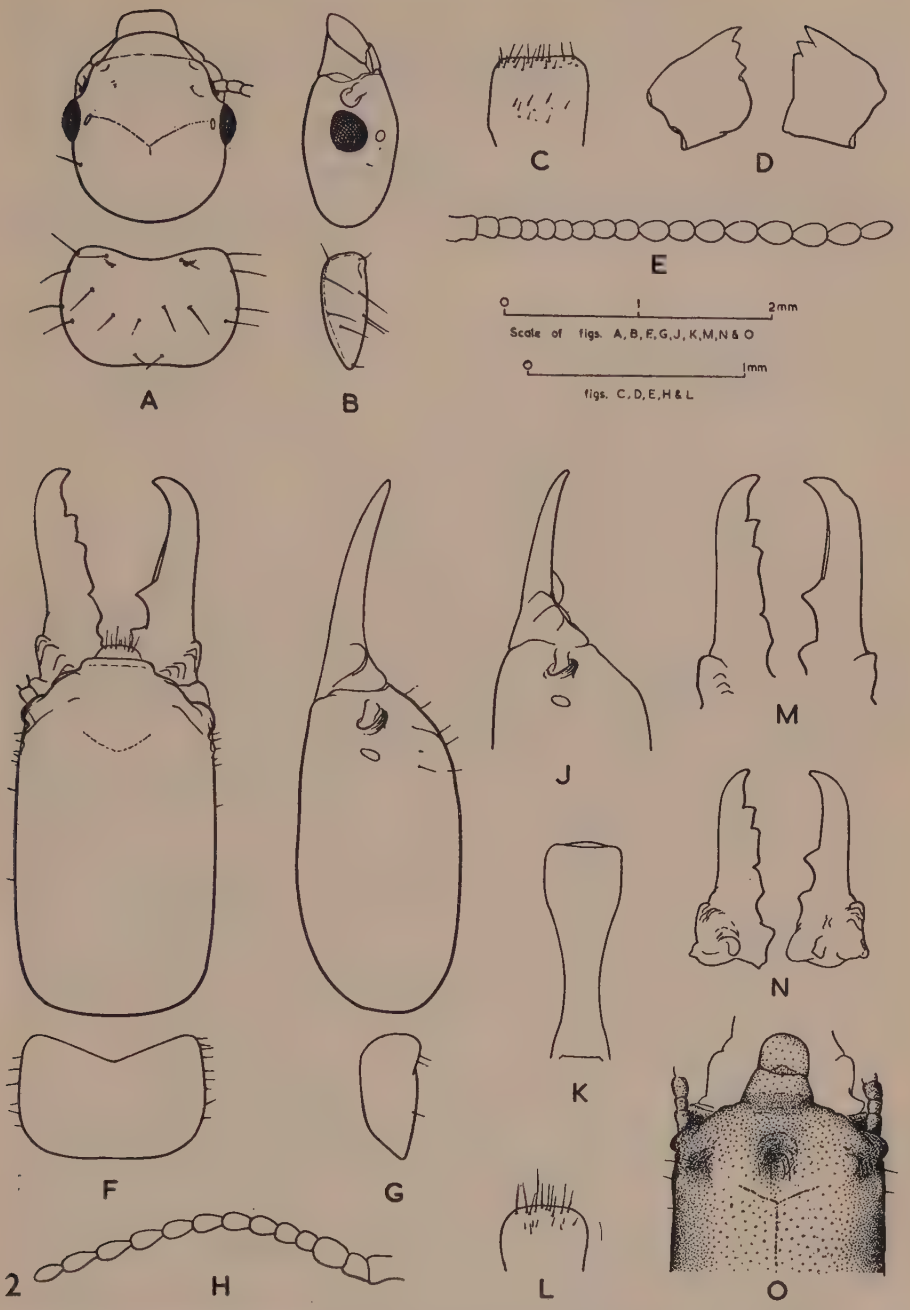


FIG. 2.—*Kalotermes angulatus* sp. n. *A–E*, Imago: *A*, head and pronotum from above; *B*, head and pronotum from side; *C*, labrum; *D*, mandibles; *E*, antenna. *F–O*, Soldier: *F*, head and pronotum from above; *G*, head and pronotum from side; *H*, antenna; *J*, a sharper latero-frontal process; *K*, postmentum; *L*, labrum; *M*, long mandibles (type colony); *N*, short mandibles (type colony); *O*, a frontal depression (specimen from colony BK. 472).

Ocelli, when visible, pale spots or streaks. Antennae pale red-brown at base, yellowish distally; 10 to 14 segmented, mostly 12; third segment barrel-shaped, sometimes narrower proximally, one and a quarter to one and a half times as long as second segment. Labrum brown, bluntly rounded in front. Postmentum red-brown; waist variable, about half as wide as front part. Mandibles red-brown at base, black distally; shaped as figured, outer margin concave, base with large lateral protuberance.

Pronotum pale yellow-brown; shining, lightly reticulate; setae small and sparse; shape variable, front edge sharply emarginate. Rest of body and legs pallid to pale yellow-brown, tibial spines and claws darker.

	Mean (mm.)	Range (mm.)
Length of head to front angles . .	2·60	2·31–2·96
Maximum head width . . .	1·58	1·43–1·82
Width of head at front angles . .	1·41	1·28–1·61
Maximum head depth . . .	1·34	1·21–1·50
Length of left mandible . . .	1·64	1·43–2·23
Maximum length of pronotum . .	1·04	0·85–1·25
Maximum width of pronotum . .	1·55	1·28–1·82
Length of hind tibia	1·16	1·02–1·35

Described from 175 specimens (25 measured) from 17 colonies.

Relationships.—*K. angulatus* is close to *K. mutubae* Harris and *K. sibayiensis* Coaton, the group being chiefly characterised by the soldier mandibles, which have a marked compression bulge at the base and thereafter curve outwards or are straight for half their length. Judging by its description and geographical location it is probable that the unique alate of *K. jeannelanus* Sjöstedt is a fourth member, but it has not been possible to examine the type.

The alate of *angulatus* is distinguishable from that of *mutubae* initially on its very much darker brown colour. Colour as a separation factor is generally not satisfactory, but in this instance is constant and obvious. Immature pale specimens can still be recognised by the ocellus being well separated from the small eye, and the coarse papillae and tuberosities of the wings are visible even before they darken. These characters are also valid in dividing the imago from all other E. African *Kalotermes*. The Zululand *sibayiensis* has the ocellus apart from the eye, and brown wings, but the papillae are less strongly marked, and the wings themselves even shorter than those of *angulatus*. Furthermore the general colour is much paler, and in contrast to this species the legs are unicolorous or the tibiae darker than the femora.

The soldiers are less easy to separate owing to similarity within the group and variation in the species. Compared with *mutubae*, *angulatus* is normally larger, has a longer head capsule, a larger pronotum with more developed corners, and a postmentum which is parallel sided at the front instead of diverging anteriorly. The third antennal segment is less broad compared with the fourth, and is rarely so squat or straight sided. From one specimen and Coaton's description, *sibayiensis* is similar to *mutubae*.

Material.—Holotype: alate female. Allotype: alate male. Morphotype: soldier. British Museum (Natural History).

Type colony.—Tanganyika: East Usambara, Amani, Kiswani. In "*sedera*" by road. 8.xi.1951 (*P. B. Kemp* No. 333).

Other records.—Tanganyika: Amani area, 24.viii.1938 (*W. V. Harris* 375); various dates xi.1950 to i.1952 (*P. B. Kemp* 72, 94, 253, 260, 273, 472,

473, 474); ii.1952 (*W. A. Sands* 49); E. Usambara, Daluni, iv.1952 (*PBK.* 478): W. Usambara, Shume, x.1951 (*PBK.* 308): W. Usambara, Mlalo, x.1951 (*PBK.* 309).

Bionomics

Distribution.—The species is known only from the East and West Usambara Mountains, where it is confined to the rain forest and Cedar (*Juniperus procera*) forest. It is likely to be found subsequently in similar habitats in the Pare Mountains.

Other information.—Kemp (1955, The Termites of North-eastern Tanganyika: their distribution and biology. *Bull. ent. Res.* **46**: 113–135) gives a summary of her observations on this insect. It is referred to there as *Procryptotermes* sp. (72) and *Procryptotermes angulatus*. This is a *nomen nudum*, based on a manuscript name given by Emerson to Harris' WVH. 375. I am indebted to Professor Emerson for permission to describe this species.

Neotermes aridus sp. n.

Imago (fig. 3, *A–E*).—Head capsule pale brown; shining; setae sparse, minute, a more prominent one behind each eye. Eyes black; large and strongly convex. Ocelli white; oval and bulbous, very large; touching eyes. Antennae pale yellow-brown; 18–21 segmented, mostly 20; third segment darker than others, somewhat longer than second. Labrum yellow-brown. Mandibles as figured.

Pronotum colour, surface and setae as head, but with several large bristles, usually one on front and 4 on side margins, and one towards centre; broad and short, front and hind borders emarginate, posterior and postero-lateral angles usually well-marked. Meso- and metascuta yellowish. Wings hyaline, costal to median veins brown; membrane lightly corrugated; *Neotermes*-pattern venation. Remainder of body pallid to yellow-brown, tibiae and tarsi darker than femora.

	Mean (mm.)	Range (mm.)
Length of head to front angles . .	1·53	1·39–1·75
Width of head across eyes . . .	1·79	1·68–1·94
Length of ocellus	0·24	0·20–0·27
Width of ocellus	0·18	0·16–0·20
Greatest diameter of eye . . .	0·63	0·59–0·68
Maximum length of pronotum . .	1·03	0·91–1·17
Maximum width of pronotum . .	1·84	1·65–2·08
Length of fore wing	12·6	12·0–13·6
Width of fore wing	3·9	3·7–4·1
Length of hind tibia	1·59	1·46–1·75

Described from 62 specimens (20 measured) from 4 colonies. The Marsabit population differs from the rest in having larger eyes and ocelli, more numerous bristles, and the back of the head heavily suffused with red-brown.

Soldier (fig. 3, *F–M*).—Head capsule yellow-brown, reddening towards front; shining, fairly closely covered with very small setae. Frons sloping gently, with central V-shaped depression; head rather shallow, sides converging anteriorly. Eyes black, finely facetted. Ocelli small pale spots. Antennae yellow-brown at base, becoming pallid distally; 13 to 18 segmented, mostly 17; third segment clavate, very elongate, twice as long as second; remaining segments becoming progressively more elongate, up to three times as long as broad. Labrum yellow-brown, apex evenly rounded. Postmentum colour as head capsule; much broadened in front. Mandibles red-brown at base, black distally; outer base hirsute; strongly upcurved; dentition ragged, as figured.

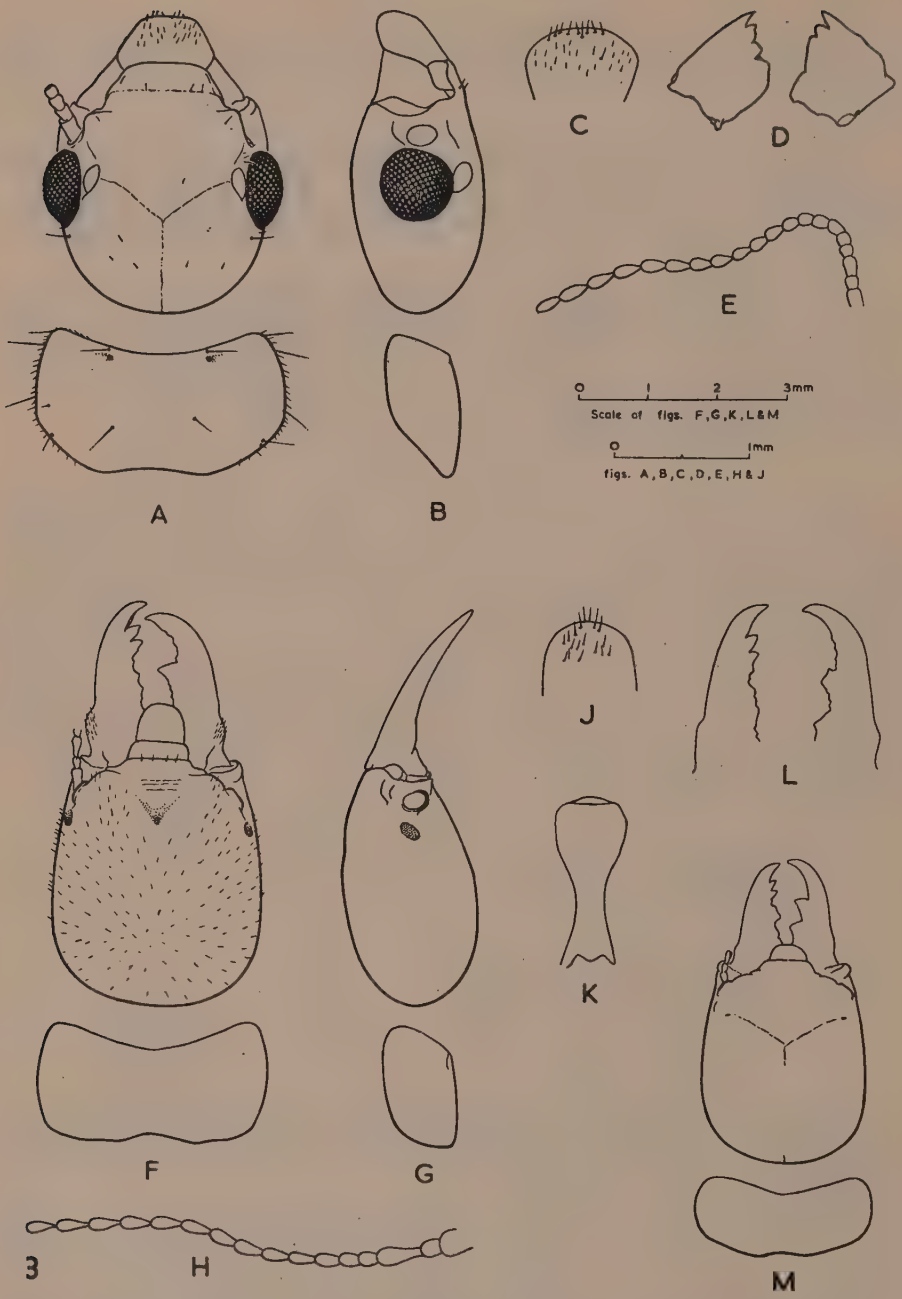


FIG. 3.—*Neotermes aridus* sp. n. *A–E*, Imago: *A*, head and pronotum from above; *B*, head and pronotum from side; *C*, labrum; *D*, mandibles; *E*, antenna. *F–M*, Soldier: *F*, head and pronotum from above; *G*, head and pronotum from side; *H*, antenna; *J*, labrum; *K*, postmentum; *L*, mandibles from WAS. 95; *M*, small specimen from Hola.

Pronotum yellowish; setae as head; very broad, usually with posterior median emargination. Rest of body and legs pale yellow to pallid, claws and spines red-brown.

	Mean (mm.)	Range (mm.)
Length of head to front angles . .	3·42	2·82–3·66
Maximum head width . . .	2·87	2·40–3·03
Width of head at front angles . .	2·36	1·90–2·53
Maximum head depth . . .	2·02	1·69–2·18
Length of left mandible . . .	2·46	1·83–2·82
Maximum length of pronotum . .	1·62	1·12–1·83
Maximum width of pronotum . .	3·22	2·53–3·52
Length of hind tibia	1·85	1·19–2·04

Described from 18 specimens (16 measured) from 6 colonies.

Relationships.—*N. aridus* is a distinctive species, possibly having affinities with *N. meruensis* (Sjöstedt).

The series of *meruensis* alates collected by the Termite Research Unit in Kenya and Tanganyika show a range of variation so great that taxonomic characters overlap those of the other East African *Neotermes* and make the construction of an effective key impossible. *N. aridus* is, however, distinguishable in most instances by its very large eyes and ocelli, and by the short, broad posteriorly emarginate pronotum. As a result of examination of the type, *N. firmus* (Sjöstedt) is considered to be a synonym of *N. meruensis*. The cotype alates of *N. laticollis* (Holmgren) differ in being red-brown, in having relatively small eyes, in the sides of the head converging markedly towards the front, and by the pronotum being considerably wider than the head.

Superficially the soldier of *N. aridus* resembles *N. laticollis* from the Seychelles. The latter species differs in having shorter mandibles with glabrous bases, fewer but larger setae, unpigmented eyes, and shorter antennae. The combined features of attenuated antennae, anteriorly converging flattened head capsule, black eyes, and strongly upcurved mandibles with distinctive dentition make *N. aridus* readily distinguishable from its congeners on the African mainland. It has some structures in common with *meruensis*, the distribution of which brings it to suitable niches in *aridus* country. The features shared include a shallow frons and hairy mandible base.

Material.—Holotype: alate female. Allotype: alate male. Morphotype: soldier. All in British Museum (Natural History).

Type colony.—KENYA: Voi. In branch of *Commiphora*. 4.iii.1952 (*W. V. Harris* 817).

Other records.—KENYA: Voi. iii.1952 (*W. A. Sands* 95). Near Garissa, vii.1954 (*WW.* 134, *WW.* 138). Near Marsabit, iii.1953 (*WAS.* 478, *WAS.* 484).

Bionomics

Distribution.—Voi is thought to be near the southern limit of this xerophilous species, and its range is expected to extend through the drier *Acacia- Commiphora* bushland of Kenya and into Somalia. It appears to be adapted for survival in semi-desert conditions, in situations similar to those tolerated by *Epicalotermes aethiopicus* Silvestri and *E. kempae* (Wilkinson).

Host trees.—Five of the six known colonies were living in species of *Commiphora*, the dead branches of which had been reduced to tubes.

Alate production.—The colonies found in early March all contained fairly mature winged reproductives.

Glyptotermes ignotus sp. n.

Imago (fig. 4, *A–E*).—Head capsule dark chestnut-brown, a deeper streak running back from upper edge of each eye; surface shining, sometimes with traces of reticulation; setae sparse, small. Eyes black; oval, flatly convex; perimeter in some instances narrowly occluded by orbit. Ocelli white; almost round; touching eye or orbital ring. Antennae medium brown; with 13, sometimes 12, segments; third segment slightly longer than second; proportion of remainder as figured, but terminal varies from as big as penultimate to half that size. Labrum yellow-brown. Mandibles yellow-brown, dentition figured.

Pronotum colour and sculpture as head; fairly prominent marginal fringe of uneven setae, few short setae on surface, including one large central pair; sides and hind margin rounded, latter sometimes slightly emarginate. Meso- and metascuta slightly paler than head. Wings brown, coppery-iridescent; colour mainly due to strong costal, radial and median veins, and to brown-capped, well defined papillae on membrane; *Glyptotermes*-pattern venation. Rest of thoracic and abdominal plates red-brown. Femora sepia-brown; tibiae and tarsi pale yellow-brown, claws and spines darker.

	Mean (mm.)	Range (mm.)
Length of head to front angles	0·79	0·74–0·83
Width of head across eyes	0·84	0·83–0·87
Diameter of ocellus	0·07	0·06–0·07
Greatest diameter of eye	0·26	0·25–0·27
Maximum length of pronotum	0·53	0·51–0·56
Maximum width of pronotum	0·75	0·70–0·81
Length of fore wing	4·6	4·4 –4·8
Width of fore wing	1·2	1·1 –1·3
Length of hind tibia	0·69	0·63–0·72

Described from 17 specimens (all measured) from 2 colonies.

Soldier (fig. 4, *F–N*).—Head capsule yellow-brown; smooth and shining, slightly uneven or faintly sculptured in parts; setae sparse. Frons flat, moderately steep; latero-frontal bulges variable in prominence. Eyes small, unfacetted, same colour as head or paler. Ocelli pale streaks. Antennae pale yellow-brown, 10 to 13 segmented, mostly 11; third and fourth segments usually small and imperfectly separated; remaining ones somewhat flattened. Labrum yellow-brown, ligulate. Postmentum yellow-brown; broadest near front, sides converging gently posteriorly; sides of anterior half may be parallel. Mandibles dark brown; relatively long, dentition figured.

Pronotum colour and surface as head; setae sparse except on side margins. Rest of body and legs pale yellow-brown to pallid, claws and spines darker.

	Mean (mm.)	Range (mm.)
Length of head to front angles	1·37	1·29–1·52
Maximum head width	0·90	0·85–0·97
Width of head at front angles	0·78	0·70–0·87
Maximum head depth	0·82	0·77–0·87
Length of left mandible	0·71	0·65–0·77
Maximum length of pronotum	0·52	0·43–0·59
Maximum width of pronotum	0·87	0·74–1·02
Length of hind tibia	0·63	0·56–0·70

Described from 9 specimens (all measured) from 5 colonies. The morphotype soldier —the only one in definite association with alates—appears to be nanitic.

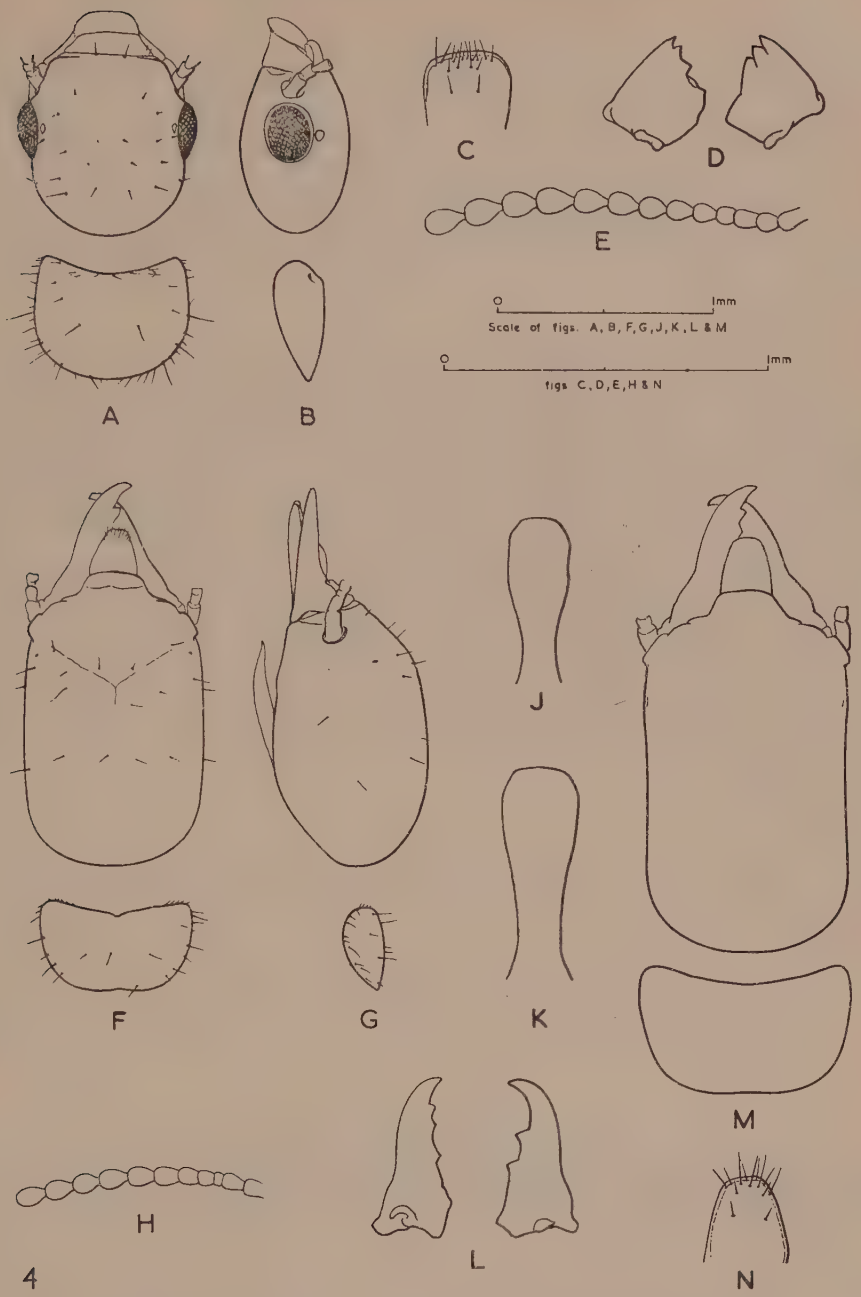


FIG. 4.—*Glyptotermes ignotus* sp. n. *A–E*, Imago: *A*, head and pronotum from above; *B*, head and pronotum from side; *C*, labrum; *D*, mandibles; *E*, antenna. *F–J*, Morphotype soldier: *F*, head and pronotum from above; *G*, head and pronotum from side; *H*, antenna; *J*, postmentum. *K–N*, Paratype soldier (WW. 335): *K*, postmentum; *L*, mandibles; *M*, head and pronotum from above; *N*, labrum.

Relationships.—The alate is distinct from all other described African *Glyptotermes* in having a shining surface to the head capsule. In total size it lies below the known variation range of *G. insulanus* Silvestri and *G. kawandae* Wilkinson, and also of the figures given by Coaton for his *G. ueleensis*, but the eye is relatively large, and its longest diameter is comparable with those of the above species. The strongly reticulate heads of *G. parvulus* (Sjöstedt) and *G. reticulatus* Wilkinson, similar in size to *G. ignotus*, serve for simple separation. Between the two last-named species is the further distinction of the number of antennal segments—10 or 11 in *reticulatus* and 12 or 13 in *ignotus*; and in the number of papillae between the median and cubitus veins—5 or 6 and 7 to 9 respectively.

The soldier is considerably smaller than those of *insulanus*, *kawandae* and *ueleensis*. From nanitic forms of the sympatric *kawandae*, and from *parvulus* it can be distinguished by the long labrum having relatively straight sides and a truncate tip. A further difference lies in the broad front of the postmentum, for the widest part of the other four species is at least a third of the way back. These two characters hold good for the similarly sized *reticulatus*, which in addition contrasts with *ignotus* in having no raised antennal carinae, and in possessing a finely reticulate head surface.

Material.—Holotype: alate female. Allotype: alate male. Morphotype: soldier. All in British Museum (Natural History).

Type Colony.—Uganda: 19 miles from Kampala on the Jinja road. Alt. 3800 ft. Tall forest with abundant lianas and thick undergrowth. In small hard snag on fallen tree. 2.iii.1955 (*WW*.334).

Other records.—Uganda: date as type colony (*WW*.335); Kyagwe, 1946 (*W. V. Harris* 471); Kawanda, v.1949 (*WVH*.563); Bukalasa, v.1949 (*WVH*.564).

Bionomics

Distribution.—The five known colonies are all from the Kampala district of Uganda. It may be a local species, but is more likely to live also in Western Uganda and the Congo.

Host trees.—Harris records his specimens from *Hevea brasiliensis*, *Erythrina excelsa* and *Cassia siamea*.

Alate production.—The alates were collected in early March, when only a few were fully darkened.

Acknowledgments

My thanks are due to Dr. René Malaise of the Naturhistoriska Riksmuseum, Stockholm for the loan of Sjöstedt type material, and to the Trustees of the British Museum (Natural History) for working facilities.

A NEW SPECIES OF THE GENUS *AËDES* FROM SOUTHERN NIGERIA

By M. W. Service

(*Federal Malaria Service, Nigeria*)

Several larvae were collected from a forest pool at Ikorodu, a small village near Lagos in S. Nigeria. These were identified with the aid of Hopkins (1952) to *Aëdes yangambiensis* De Meillon and Lavoipierre, but after comparison with a detailed description they were found to differ in several respects. Their pupae agreed in some respects with the description given by De Meillon *et al.* (1945) of *yangambiensis*, but again differences were found. The males and one female obtained failed to fit into the key given by Edwards (1941) for the subgenus *Aëdimorphus*, the nearest species to them, based solely on the characters in the key, being *minutus*. Examination of the genitalia, however, shows them to lie between *yangambiensis* and *yvonneae* Edwards, in respect of the morphology of the style. After consulting Mr. P. F. Mattingly, of the British Museum (Natural History), it was decided that they represented a new species.

They are named *wendyae* after my wife, who first found them, and after continual searching of the area produced enough larvae for a series of adults to be obtained.

All adults, pupal pelts and some of the larval skins are being sent to the British Museum (Natural History).

Aëdes (Aëdimorphus) wendyae sp. n.

Larva

The following description is based on five larval skins and one whole larva.

Head : antennae strongly spiculate, pale and about one half length of head ; tuft of about 10 sparsely plumose branches situated at about half distance from base. Seta A with about 13, B with 8, and C with 7 sparsely plumose branches ; setae B and C about equal in length. Seta *d* small and delicate, with 5 small branches. Mentum with about 18 small teeth on either side of a central tooth. *Abdomen :* comb a patch of about 18 short pale and broad scales. Siphon with convex sides and an index of about 2·4. Pecten consists of 13 heavily pigmented spines, proximal ones with one basal denticle, and distal with sometimes a second smaller denticle ; the two most distal spines simple, larger than the rest and more widely spaced. Subventral tuft minute and composed of 3 branches, situated well beyond last pecten spine. Anal segment with a more or less complete saddle ; lateral seta single. " Gills " lanceolate and about twice length of saddle. Lower caudal seta single, upper with 8 branches. Ventral brush with 4 pairs of tufts in barred area and 3 unpaired tufts proximal to the barred area.

Pupa

The following description is based upon five pelts. The terminology used is that of Edwards (1941) to facilitate comparison with descriptions of other pupae of the "*tarsalis* group".

Cephalothorax : trumpets cylindrical, ratio of trumpet : 1·2 : 1, with a width : length index of 4. *Posterior thoracic setae :* seta *O*, stout with 4–5 branches, *P* long and simple, *R* long and split into 6–7 branches. *Dorsal seta* long and split into 2, *supra alar* long and split into 2–3 branches. *Post ocular setae:* anterior hair split into 2, median into 2–3 branches; lower hair single and very long.

Anterior thoracic setae : upper anterior hair long and split into 3, lower smaller and simple; upper posterior hair split into 3, lower into 3–4 branches.

Abdomen : paddles pale, with a distinct external buttress, index 1·4, apical hair simple, about half length of paddle. External border denticulate, this being continued round apex to a little way up the inner border. *Seta A :* seg. VIII pale and split into 3 at the base, seg. VII small and simple, segs. VI–II minute and colourless. *Seta A'* larger but more slender than *A*, 2 branched. *Bristle B :* seg. VII short and simple, VI larger and simple, V long and simple, IV long and split into 2 at base ; III long and simple, II long and simple. *Bristle C :* seg. VII single, VI 2-branched, V 2-3-branched, IV 3-branched, III a tuft of about 7 branches, II a distinct tuft of hair.

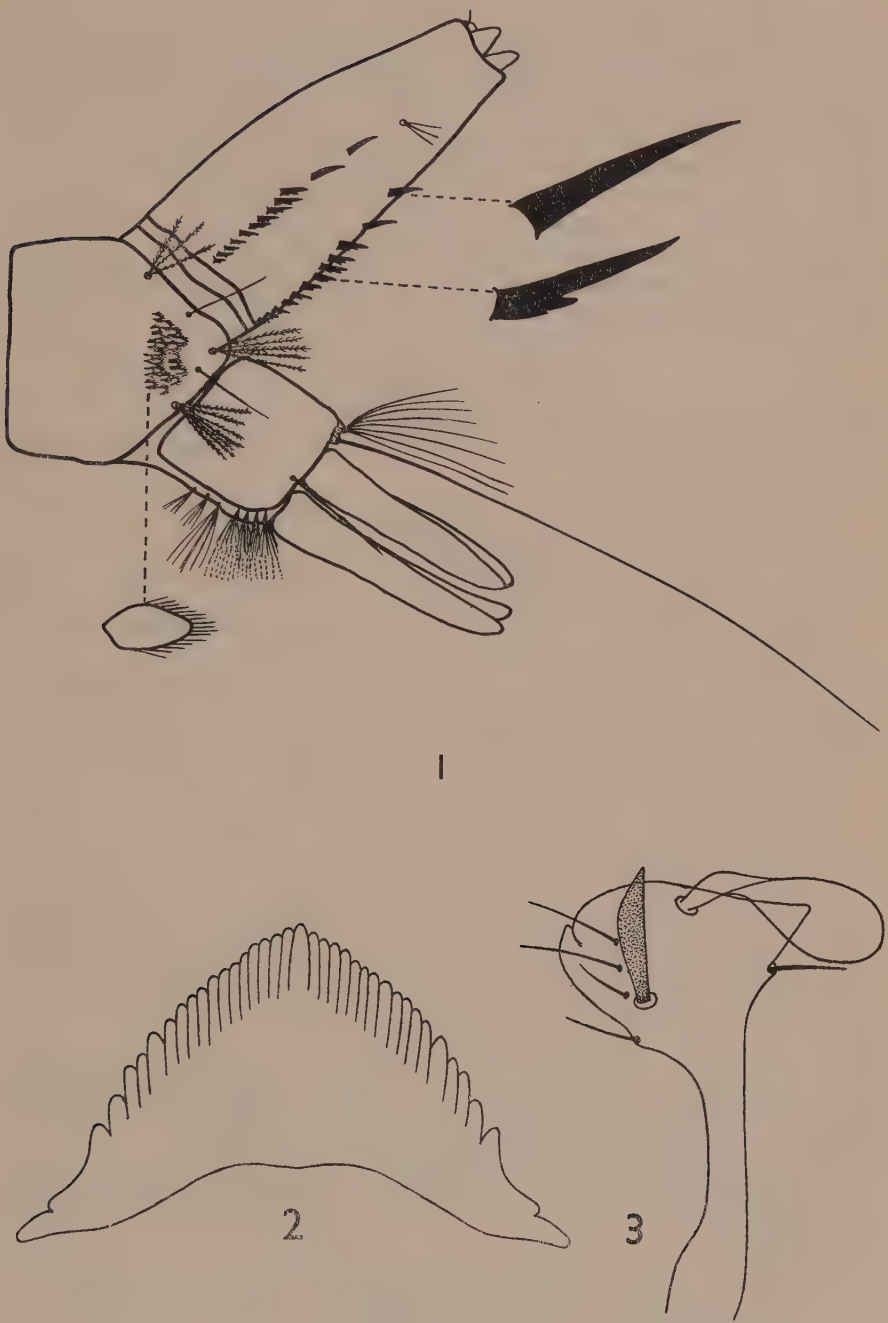
Hairs : H simple, *K* simple and one and a half times as long as *H*, *L* very small and split into 2–3 branches, *M* a tuft of 10–12 branches, *S* and *T* long, of about equal length, and each split into 2 branches.

Adult

The following description is based on four available males.

Head : decumbent scales of vertex flat, broad and white, together with a few narrow white curved scales in middle of vertex and also between the eyes, erect truncated scales black and occupying middle of vertex. Tori bare. Palps entirely dark, a little shorter than proboscis. *Thorax :* dorsal surface dark brown, entire surface covered with dark narrow curved scales. Two groups of not more than 10 white narrow curved scales situated laterally towards edge of scutum, forming a pair of indistinct pale spots ; no other white or golden scales present. Scutellum with middle lobe bearing dark broad scales, outer few white ; both outer lobes entirely white scaled ; scutellum and scutal bristles long and dark ; propleura with a few white scales ; anterior pronotum appears to be without scales ; posterior pronotum with flat white scales ; pre-alar scales flat and white ; both postspiracular and subspiracular scales absent. Paratergite with a few broad flat white scales. Mesepimeron with a tuft of scales and the sternopleura with two tufts of broad white scales. Wings totally dark scaled. Fore legs : femur white scaled posteriorly from base to apex, anteriorly dark scaled ; tibia white scaled posteriorly, and with an indistinct small white apical spot ; tarsi all dark scaled. Middle legs : femur and tibia as for fore legs ; tarsi all dark. Hind legs : femur as before ; tibia white scaled posteriorly and with a large well defined white apical spot ; tarsi all dark scaled. *Abdomen* dark scaled, but tergites with basal lateral white spots which are usually joined across the segment, forming narrow white basal bands ; the lateral spots separate on latter few segments. Sternites with large white basal bands. *Genitalia :* coxites broad and short, style with a long narrow stem expanding at end to form a club, produced internally to form a point and with a large membranous leaf and broad, flat pointed spine. Apart from the above small hairs present on external border of style, and inner border bears a long and well developed single hair. No horn present, being replaced by a very small snick.

Female.—The solitary female specimen similar in external characters to the males, except that it appears to lack the white lateral abdominal spots on the tergites : sternites with white spots, as in the males.



FIGS. 1–3.—*Aëdes* (*Aëdimorphus*) *wendyae sp. n.* (1) Anal segments ; (2) mentum ; (3) style.

Discussion

The immature stages are close morphologically to *yangambiensis*. The male genitalia resemble those of the "*tarsalis* group", and are intermediate between those of *yangambiensis* and *yvonneae* (the genitalia of the latter are described in Edwards (1941) and of the former, in De Meillon and Lavoipierre, (1944)). They differ from those of *yangambiensis* in not having even a small horn, and in the possession of a more slender spine, and from *yvonneae* in having a much broader spine and also a very broad membranous leaflet. The latter is also situated away from the apex of the club, thus differing in position from that in the above two species. On external characters the adults are nearer to *yangambiensis* than *yvonneae*, since, like the former, they have the decumbent scales of the head broad and not narrow.

Acknowledgments

The author wishes to thank Sir Samuel L. A. Manuwa, C.M.G., O.B.E., Chief Medical Adviser to the Federal Government of Nigeria, for permission to publish this paper.

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Book Notice

Insects of Hawaii. By Elwood C. Zimmerman. Vol. 7. *Macrolepidoptera.* Vol. 8. *Lepidoptera : Pyraloidea.* 8vo. Honolulu (University of Hawaii Press), 1958. Pp. xiv, 542 ; pp. xii, 456, text illust. Price $9.50 ; $8.00.

These are the two latest volumes to appear in this series in which the author will list all the known Hawaiian insects.

Vol. 7, *Macrolepidoptera*, consists of a check list ; a summary of nomenclatural changes and a short history of the study of Hawaiian Lepidoptera, followed by the main body of the text in which the families and subfamilies are classified and described with details of localities and host plants.

Vol. 8, *Pyraloidea*, continues the study begun in the previous volume and was written concurrently with it. In it 226 species of pyraloid moths contained in 44 genera, of which 190 species and seven genera are endemic, are classified and described.

Both volumes contain many nomenclatural changes. The text is illustrated with numerous photographs and line drawings and there is an extensive bibliography in each volume.

A NEW SPECIES OF THE GENUS *ACROTYLUS* FIEBER, 1853 (ACRIDOIDEA, ORTHOPTERA)

By Joyce B. Mason
(*Anti-Locust Research Centre*)

Acrotylus daveyi sp. n.

Male (Type). Body of medium size, moderately robust, covered with sparse long hairs.

Antennae nearly one and a half times length of head and pronotum together. Head slightly inflated. Fastigium of vertex elongated, deeply concave, with high lateral carinulae and truncate apex, at base separated from vertex by deep transverse furrow. Weak median carinula of vertex present. Fastigial foveolae shallow. Frontal ridge wide, slightly constricted below the ocellus, narrowing at apex, widely sulcate in upper two-thirds. Facial carinulae well developed, sinuate. Eye large, strongly convex. Ocelli comparatively large.

Pronotum short and broad, strongly sculptured ; median carina high, deeply interrupted by two transverse sulci, ridge-like in metazona. Anterior margin of prozona broadly obtusangulate. In prozona a pair of large convexities with two callosities at the basal sulcus, with the lower margin excurved in the middle. Lateral lobes higher than their length.

Mesosternal interspace twice as broad as its length ; mesosternal lobes short and wide with widely rounded internal side and slightly curved posteriorly. Metasternal interspace twice as broad as its length.

Elytron exceeds apex of abdomen, about one and a half times length of pronotum. Venation common to the genus. Membrane of elytra in apical third transparent and lustrous ; no secondary longitudinal veinlets present between branches of main veins of elytra.

Anterior and middle legs thin and long. Hind femur moderately slender, with the knee slightly protruding beyond end of abdomen. Lower lobe of knee rounded. Spurs of hind tibia long and thin, pair on internal side longer than external pair. Basal segment of tarsi with two pulvilli. Arolium small, slightly less than half length of claw, which is comparatively long and thin.

Subgenital plate short, subconical. Supra-anal plate triangular, with obtuse apex, with shallow longitudinal sulcus in basal half, sides undulated. Cercus short, robust, conical, narrowing towards obtuse apex.

Epiphallus bridge-shaped, lophi bilobate, moderately sculptured.

General coloration mottled brownish-buff. Antenna with alternate light and dark brownish rings. Anterior and middle legs with scattered brown spots. Elytron with three transverse brown fasciae which are darker in anterior part, fading towards posterior margin. Pronotum with two brownish lateral spots and two white callosities in prozona. Lateral lobes yellowish, posterior edge with small dark brown spots. Wing pale blue with faint and incomplete brown fascia in middle and a brown spot at apex. Hind tibia light greyish-buff, with dark spines, base of tibia with a brownish ring. Hind femur with small dark brown spots on upper and lower external carinula ; above with four irregular transverse fasciae ; on internal side one incomplete fascia in apical half.

Female (Paratype). As the male, but slightly larger. Ovipositor short, moderately robust, with weakly curved valves, black at apices. Subgenital plate with weakly excurved apical margin.

Length of body, ♂ 15·1–17·4, ♀ 17·2–19·9 ; pronotum, ♂ 2·6–2·9, ♀ 2·7–3·0 ; elytron, ♂ 15·8–17·0, ♀ 16·6–17·9 ; femur, ♂ 9·6–10·5, ♀ 10·2–11·6 mm.

Type locality, FRENCH SUDAN : Kodaga, 13.iii.1957, 12 ♂ including type, 14 ♀ (*J. T. Davey*). Type in the British Museum (Nat. Hist.).

In the studied series the general coloration varies from pale buff to dark grey. The wing varies from pale bluish to pale pinkish. In half the specimens a fourth very small dark brown fascia is found on the elytra.

FIGS. 1–4.—*Acrotylus daveyi* sp. n. (1) Head and pronotum in profile ; (2) hind femur ; (3) spurs of hind tibia and tarsus ; (4) epiphallus.

This species is superficially similar to *A. variegatus* Brancsik, but differs from it in the more sculptured and robust pronotum with larger lateral tubercles in the prozona ; the relatively larger head, with more vertical frons, and the incomplete pale brown fascia on the middle region of the wing, which is absent in *A. variegatus*.

Morphologically this species is nearest to *A. furcifer aurantius* Uvarov, but differs from it in the slightly more sculptured pronotum ; the smaller head and eyes ; the longer spurs on the internal side of the hind tibia ; the more mottled general coloration and the wing coloration, which in *A. furcifer aurantius* is orange or yellowish, with dark brown fascia on the posterior margin.

THE SPECIES OF *PHLEBOTOMUS* (DIPTERA: PSYCHODIDAE) IN BRITISH HONDURAS*

By D. J. Lewis[1] and P. C. C. Garnham[2]

[1] (*Scientific staff, Medical Research Council; care of the British Museum (Natural History)*), [2] (*London School of Hygiene and Tropical Medicine*)

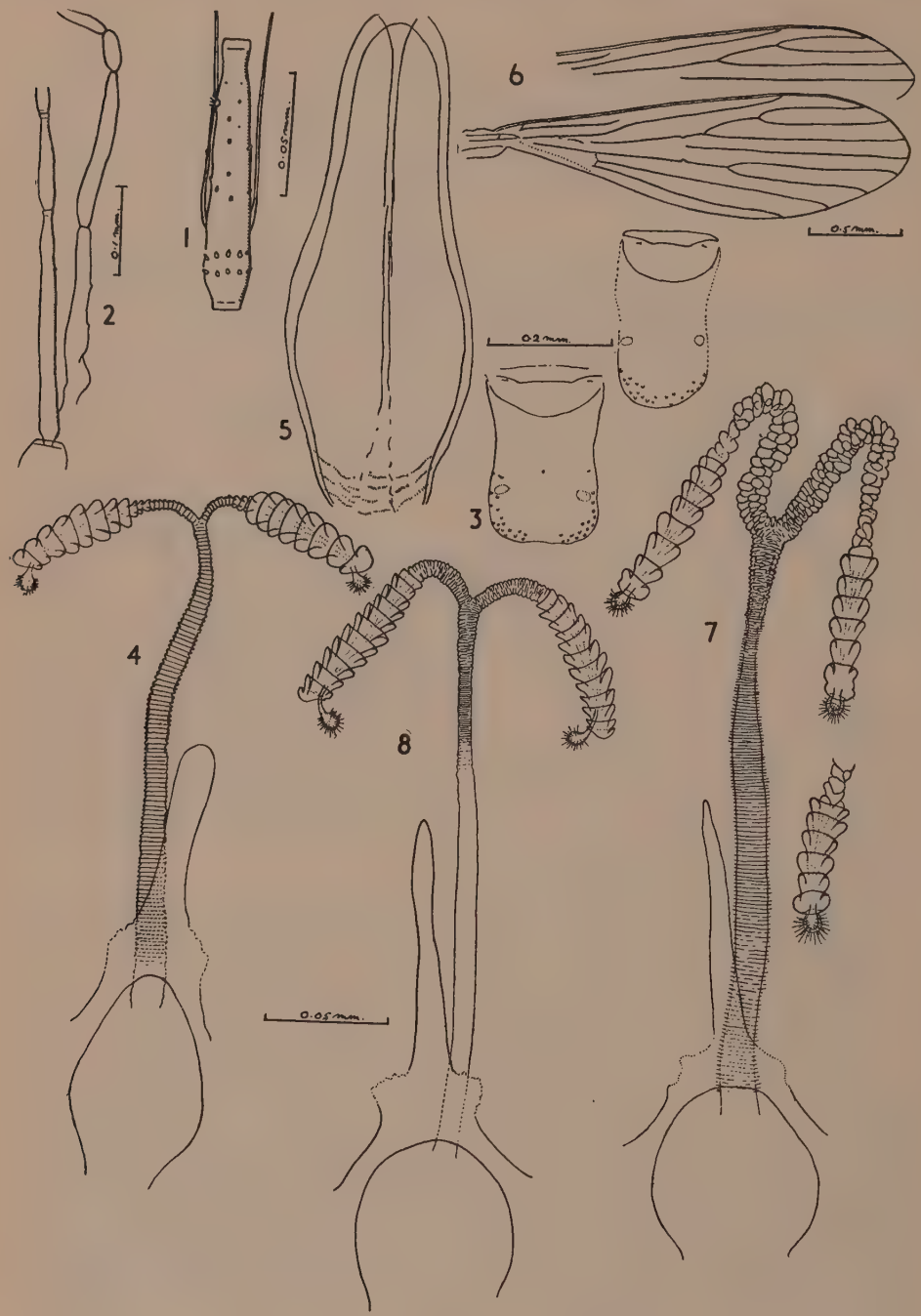
The *Phlebotomus* flies recorded in this paper were collected in the El Cayo district during January and February, 1958, in the course of a survey of cutaneous leishmaniasis (Garnham and Lewis, 1959).

The distribution lists of American *Phlebotomus* compiled by Barretto (1947) and Pessoa and Barretto (1948) do not include British Hondurus, and the first record from that country was published by Vargas and Nájera (1953); they reported 29 species, mainly Neotropical, from Mexico, and included a record of *Phlebotomus panamensis* Shannon from British Honduras. In the present work 293 specimens were obtained—the number being limited by exceptionally dry weather—and were found to comprise 14 species.

Specimens were mounted in Puri's chloral-gum medium and examined without their hairs and scales. Very delicate structures—the ascoids of some species and the spermathecal ducts of a member of the *P. vespertilionis* group—were examined by diluting a mounted specimen with water until the refractive index became suitable. Experience showed that the medium used was very satisfactory in England, but that in British Honduras, owing to high humidity in the rains, chloral-gum medium might have to be dried artificially and ringed, or replaced by another mountant.

In the descriptions of some specimens notes are given on certain features of the abdominal cuticle, including the second sternite, which was described by Hertig and Fairchild (1950). They pointed out that it varied considerably in appearance but was particularly useful for associating flies of different sexes. Several cuticular structures combine to form a pattern which is useful in this way—the shape and relative sizes of certain sclerites, the distribution of brown pigment, of smooth spots and of large and small setae, and the general distribution of microtrichia. The sclerites are often outlined by the contrasting soft cuticle but are sometimes difficult to see. Pigment often occupies nearly the whole area of a sclerite but is sometimes much less extensive; occasionally it is found on smooth spots outside the main sclerites. The smooth spots are small areas, usually more or less oval or round, which are in contrast to the surrounding area of microtrichia. The spots include the circular markings on the sternites described by Hertig and Fairchild (1950) and appear to be of the same nature as the smooth areas found by Lewis (1957) on the cuticle of *Simulium damnosum* Theobald.

* A grant from the Colonial Development and Welfare Fund, awarded by the Colonial Office, helped to finance this work.



FIGS. 1–7.—(1)–(4) *Phlebotomus bispinosus* F. and H. (1) ♀, fourth antennal segment; (2) palp; (3) second sternite; (4) spermathecae; (5)–(7) *P. geniculatus* Mang. (5) ♀, pharynx; (6) wing; (7) spermathecae. (8) *P. panamensis* Shann., ♀, spermathecae.

Phlebotomus (*Psychodopygus*) *bispinosus* Fairchild and Hertig (Figs. 1–4)

As Fairchild and Hertig (1951 : 406) pointed out, records of species of this group, based on the female alone, are open to question. The three females examined are provisionally assigned to this species, although they show certain differences from the original description. The ascoids on the fourth antennal segment, which are very slender and difficult to see, are considerably longer than the segment. The common spermathecal duct is very long in two of the specimens and rather folded in the third.

Localities : Cool Shade, 11.i, 1 ♀; Guacamallo, 17.i, 1 ♀; Sayab Camp, 16.i, 1 ♀.

Phlebotomus (*Psychodopygus*) *geniculatus* Mangabeira (Figs. 5–7)

The specimens examined, all females, correspond fairly closely to the description of this species by Fairchild and Hertig (1951) but differ as follows. The fourteenth antennal segment of one specimen bears one delicate ascoid. The chitinous arch of the cibarium is very faint. The spermatheca varies in appearance and has from 6 to 8 segments. The length of the ducts does not accord exactly with the description but varies somewhat according to the amount of shrinkage or expansion in a particular mount ; the annulations at the distal end (near the furca) are not much fainter than the others.

Localities : Cool Shade, 11.i, 2 ♀, 14.i, 1 ♀; Guacamallo, 17.i, 1 ♀; Sayab Camp, 16.i, 1 ♀.

Phlebotomus (*Psychodopygus*) *panamensis* Shannon (Fig. 8)

The available specimens agree with the description by Fairchild and Hertig (1951).

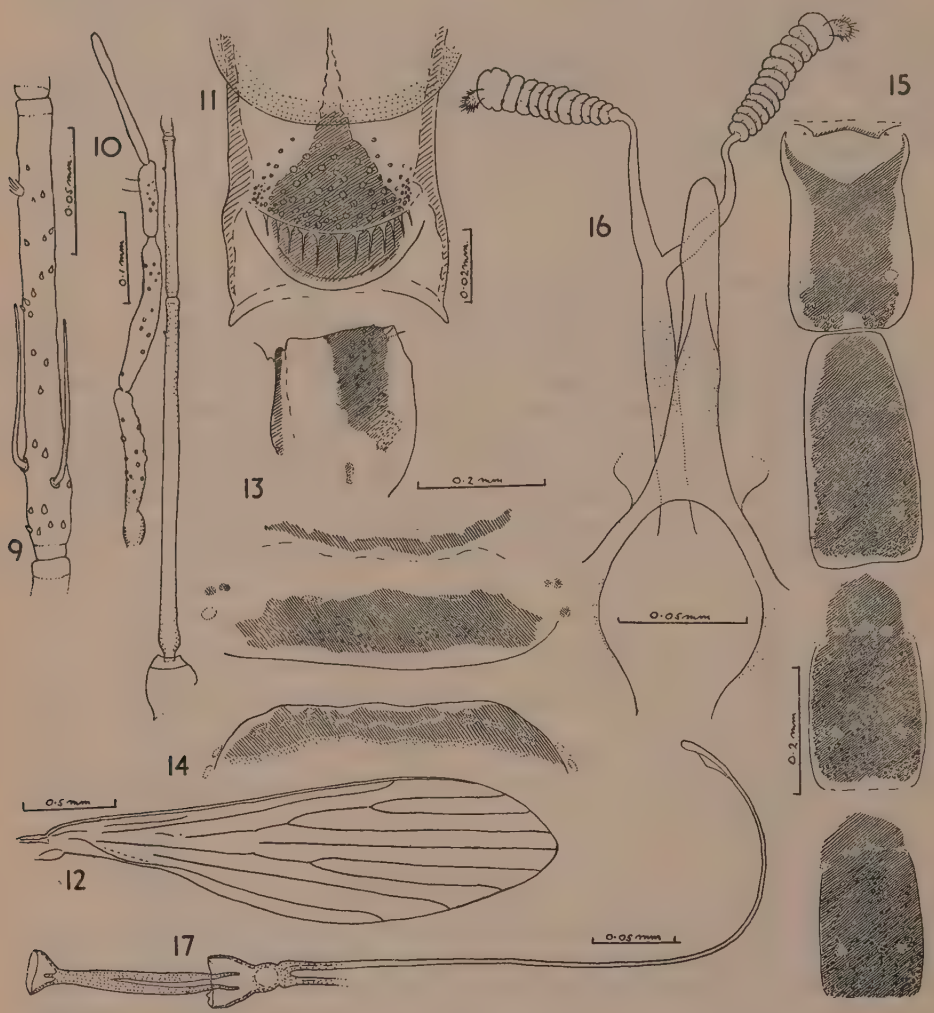
Localities : Cool Shade, 11.i, 16 ♀; Guacamallo, 17.i, 13 ♀; Putchetuk, 22.i, 1 ♀; Quintana Roo forest, 2.iv.25 (*A. Dampf*) (Vargas and Diaz Nájera, 1953); Sayab Camp, 16.i, 2 ♀.

Phlebotomus (*Psychodopygus*) *apicalis* Floch (Figs. 9–17)

Specimens assigned to this species were at first thought to belong to a new one because the females lack the posterior lateral cibarial teeth shown in the drawing by Floch and Abonnenc (1952). They agree, however, with specimens presented to the British Museum by Dr. G. B. Fairchild, who had identified them by comparison with the specimens identified by Dr. H. Floch.

The ascoids on the fourth antennal segment of the female are shorter than those figured by Floch and Abonnenc. The brown area of the first tergum consists of two main parts, anterior and posterior, with very small separate lateral areas. Setae are few or absent on most of the first sternite and anterior parts of the third to fifth sternites. Dorsal smooth spots include the small brown areas on the first tergum ; and ventral smooth spots include some, on segments three to five, which lie behind the anterior bare part of the segment. The anterior tip of the genital fork varies in thickness, and the common duct of the spermathecae varies in length, extending beyond the fork in some specimens.

Localities : Cool Shade, 11.i, 2 ♀; Putchetuk, 22.i, 3 ♀; Sayab Camp, 15.i, 1 ♀, 1 ♂.



FIGS. 9–17.—*Phlebotomus apicalis* F. and A. (9) ♀, fourth antennal segment; (10) palp; (11) cibarium; (12) wing; (13) first abdominal tergite from side and above; (14) front edge of second abdominal tergite; (15) first five abdominal sternites; (16) spermathecae; (17) ♂, genital pump and filament.

Phlebotomus (*Psychodopygus*) *ylephiletor* Fairchild and Hertig

The specimens correspond to the description by Fairchild and Hertig (1952). The wing lengths (including the basal section of the costa) of 23 females ranged from 1·87 to 2·35 mm. and averaged 2·24.

Localities : Augustine, 17.i, 1 ♀; Guacamallo, 17.i, 28 ♀, 3 ♂; Sayab Camp, 15.i, 1 ♀.

Phlebotomus (*Psychodopygus*) sp. (*intermedius* group) (Figs. 18–22)

We prefer to leave this single male unnamed until other specimens are obtained. The fifth palpal segment is slightly longer than the third. The cibarium contains many horizontal and vertical teeth. The tubercles bearing the two terminal spines of the style are dark, the paramere is distinctly beak-shaped, and the tip of the penis filament is shaped like an open beak, rather as in *P. anduzei* Floch and Abonnenc.

Locality : Guacamallo, 10.i, 1 ♂.

Phlebotomus (*Brumptomyia*) *hamatus* F. and H. (Figs. 23–27)

The inner ascoid on the fourth antennal segment, more distally situated than the outer one, reaches the succeeding segment. The wing is rather broad. Instead of the seven spines on the distal half of the costa, figured by Fairchild and Hertig (1947*a*), there are five large ones, the proximal one very curved, and the distal one small.

Locality : Guacamallo, 10.i, 1 ♂.

Phlebotomus (*Brumptomyia*) *trinidadensis* Newstead (Figs. 28–31)

Fairchild and Hertig (1948*a*) suggested that it would be interesting to remount the females of Newstead's type series of this species. This has now been done, the cover-glasses being cut with a diamond, the balsam dissolved with a mixture of equal parts of absolute alcohol and xylol, and the specimens placed, for the time being, in chloral-gum medium, with the result that the cibarial armature and spermathecae are clearly visible. The type-female slide contained one specimen *P. trinidadensis*, as defined by Fairchild and Hertig (1948*a*), and one *P. cayennensis* F. and A., and the rest of the " type series " comprised three of each of these forms.

In this species the third and fourth abdominal sternites are much larger than the second, and the anterior smooth spots of the fourth are fused into a transverse strip.

Localities : Augustine, 17.i, 1 ♀, 1 ♂; 25.i, 2 ♀; Branch Mouth, 24.i, 1 ♂; 12.ii, 4 ♀, 7 ♂; Guacamallo, 22.1, 2 ♀; Sayab Camp, 15.i, 1 ♂; 16.i, 1 ♂.

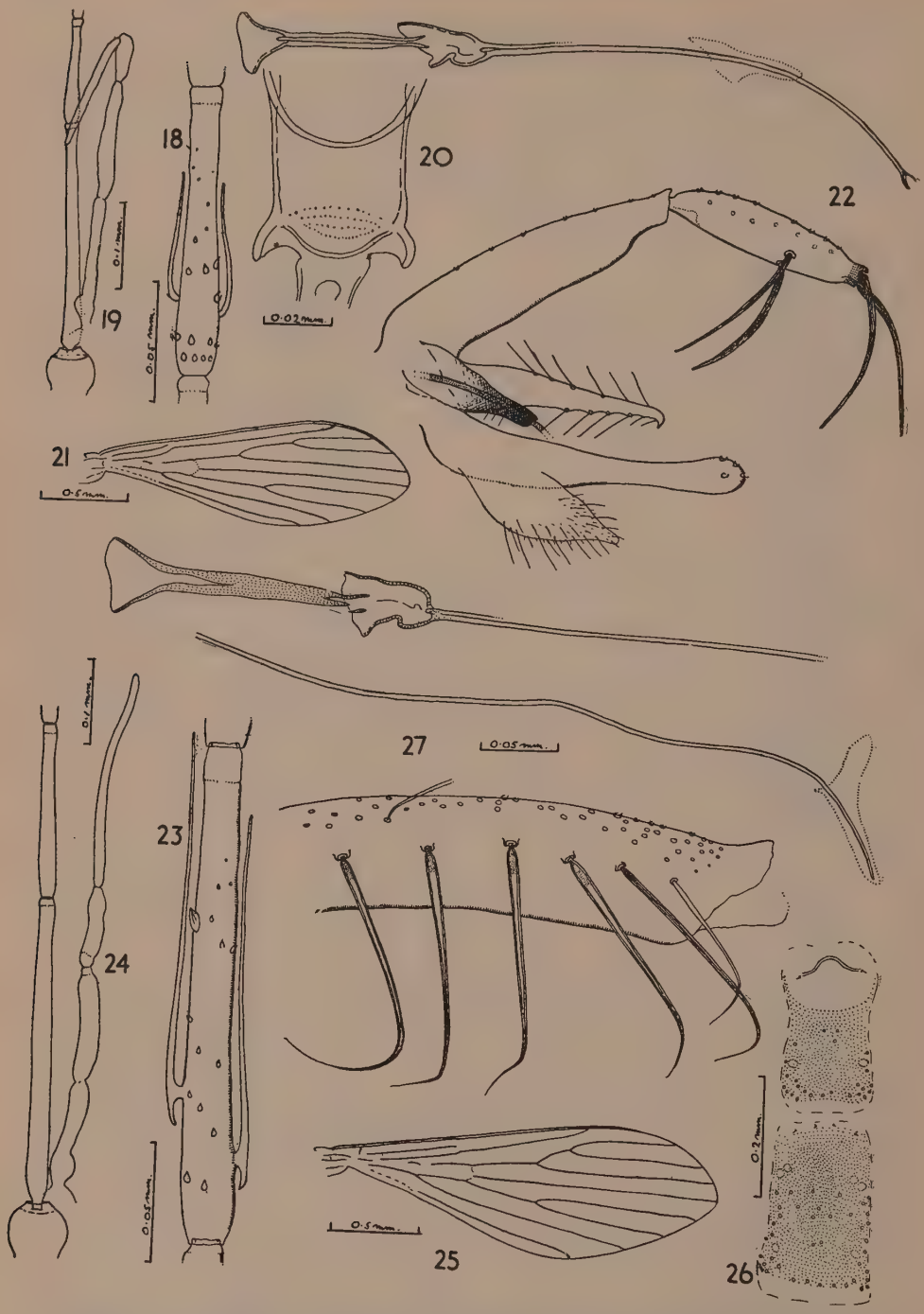
Phlebotomus (*Brumptomyia*) sp. (*vespertilionis* group) (Figs. 32–34)

This is a large fragile pale species of which attempts to find males were unsuccessful. A female was sent to Dr. Fairchild who suggested that it might be *P. beltrani* Vargas and Diaz Nájera or *P. steatopygus* F. and H. (1958). The wing of the largest British Honduras specimen is 2·6 mm. long, longer than the measurements given for *P. vespertilionis* by Fairchild and Hertig (1947*a*), who described it. The second sternite is long and scarcely pigmented, and the third has a pair of smooth spots near its anterior end. The spermathecal ducts are very delicate, more so than the spermathecae, and difficult to see.

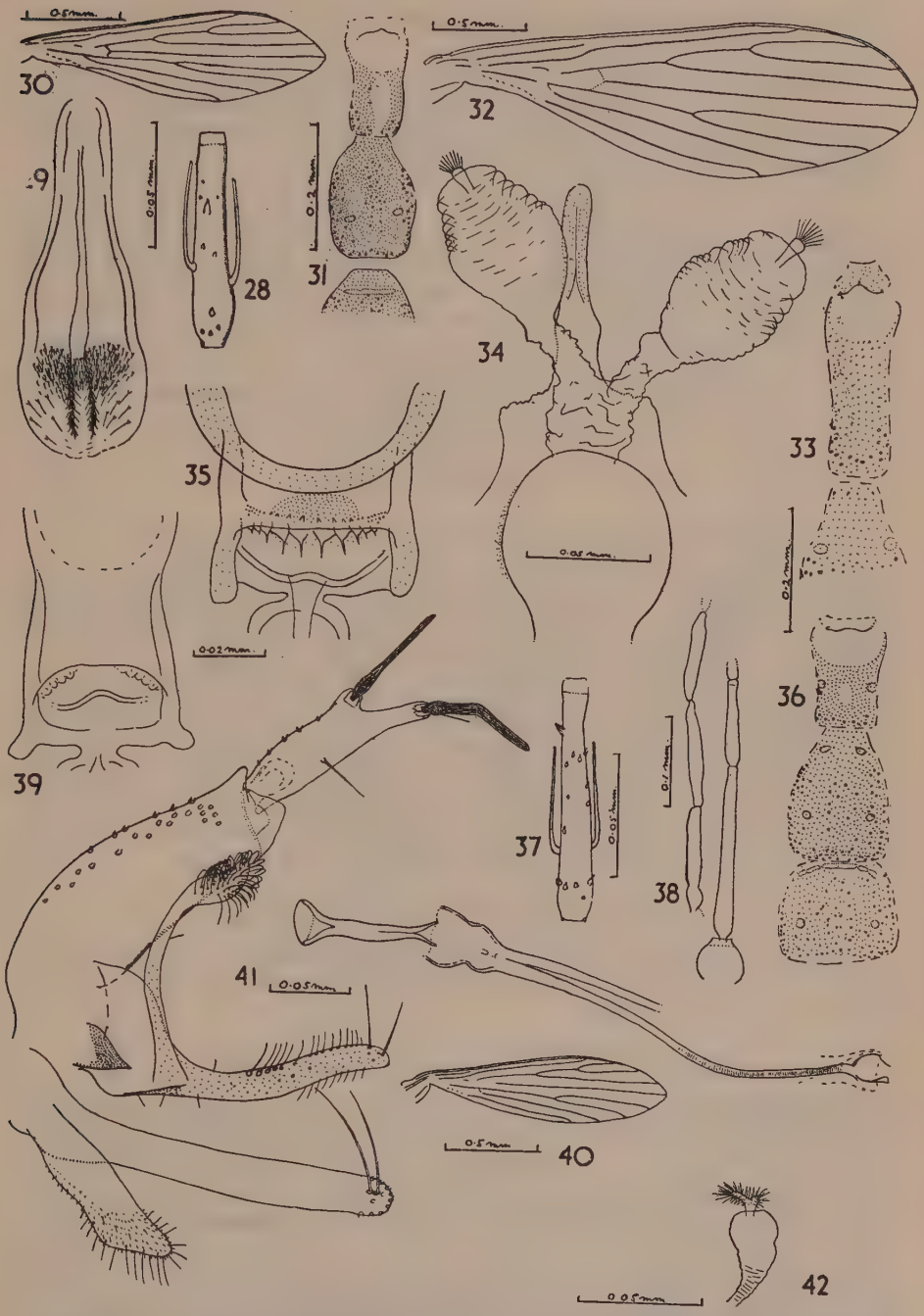
Locality : Guacamallo, 10.i, 3 ♀.

Phlebotomus (*Brumptomyia*) *permirus* F. and H., 1956 (Figs. 35–41)

The cibarium differs slightly from the original description. The horizontal teeth sometimes include an even row of more than four, and the vertical



FIGS. 18–27.—(18)–(22) *Phlebotomus* sp. (*intermedius* group). (18) ♂, fourth antennal segment; (19) palp; (20) cibarium; (21) wing; (22) genitalia and genital pump. (23)–(27) *P. hamatus* F. and H. (23) ♂, fourth antennal segment; (24) palp; (25) wing; (26) first three abdominal sternites; (27) genital pump and filaments and part of coxite.



FIGS. 28–42.—(28)–(31) *Phlebotomus trinidadensis* Newst., ♀, cotype from Trinidad; (28) fourth antennal segment; (29) pharynx; (30) wing; (31) first four abdominal sternites. (32)–(34) *P.* sp. (*vespertilionis* group). (32) ♀, wing; (33) first three abdominal sternites; (34) spermathecae. (35)–(41) *P. permirus* F. and H. (35) ♀, cibarium; (36) first four abdominal sternites; (37) ♂, probably this sp., fourth antennal segment; (38) palp; (39) cibarium; (40) wing; (41) genitalia and genital pump. (42) *P. cayennensis jamaicensis* F. and T., ♀ from Jamaica, spermatheca.

teeth are well marked, the central ones corresponding to individual horizontal teeth and pointing forwards.

Localities: Soccoths, 11.i, 1 ♀; Branch Mouth, 30.i, 3 ♀.

The male of *P. permirus* has not been described, but a male from British Honduras evidently belongs to the *anthophorus* group and may be the male of this species. Its description (figs. 37–41) follows.

Antennae and palps as figured; ascoids on all flagellar segments of antenna except the last. Cibarium with large but indistinct nodular horizontal teeth at the sides; chitinous arch not well developed. Wing length 1·45 mm. Sternites much like those of female *P. permirus*; pigmented part of second sternite divided into two distinct lobes. Penis sheath short and pointed; genital filaments with annular thickening in distal half and large terminal opening surrounded by a delicate membrane. Paramere with long arm having an expanded tip bearing curved hairs on its inner side. Style with a thick terminal spine bent near its middle (in the one available specimen), a subterminal seta on the outer surface, a thick dorsal spine in the distal half, and a ventral seta in the proximal half.

Locality of male, possibly P. permirus: Sayab Camp, 16.ii.

Phlebotomus (*Brumptomyia*) *cayennensis maciasi* F. and H.

The British Honduras specimens appear to belong to this subspecies, although the vertical cibarial teeth are rather variable in size and 18 horizontal teeth are visible in one specimen. The pigment patch tends to be narrow, like that figured by the describers, Fairchild and Hertig, 1948*b*.

Locality: Branch Mouth, 24.i, 3 ♀, 6 ♂; 30.i, 4 ♀, 22 ♂; 12.ii, 5 ♀, 37 ♂.

Incidentally we may mention two females and a male of this species taken in a cave near Discovery Bay, Jamaica, on 25.ii,1958. They are probably subspecies *jamaicensis* Fairchild and Trapido but, unlike this form as described, they are very pale and the females have 17 horizontal cibarial teeth and a double spermathecal knob (fig. 42). In this form and *P. c. maciasi* the posterior parts of the third and fourth abdominal sternites are very smooth.

Phlebotomus (*Brumptomyia*) *shannoni* Dyar

Localities: Augustine, 25.i, 1 ♀; Branch Mouth, 24.i, 1 ♂ (probably, damaged); Cool Shade, 11.i, 11 ♀, 21 ♂; 29.i, 1 ♀; Guacamallo, 17.i, 8 ♀, 3 ♂; Sayab Camp, 16.i, 6 ♀, 6 ♂.

Phlebotomus (*Brumptomyia*) *cruciatus* Coquillett

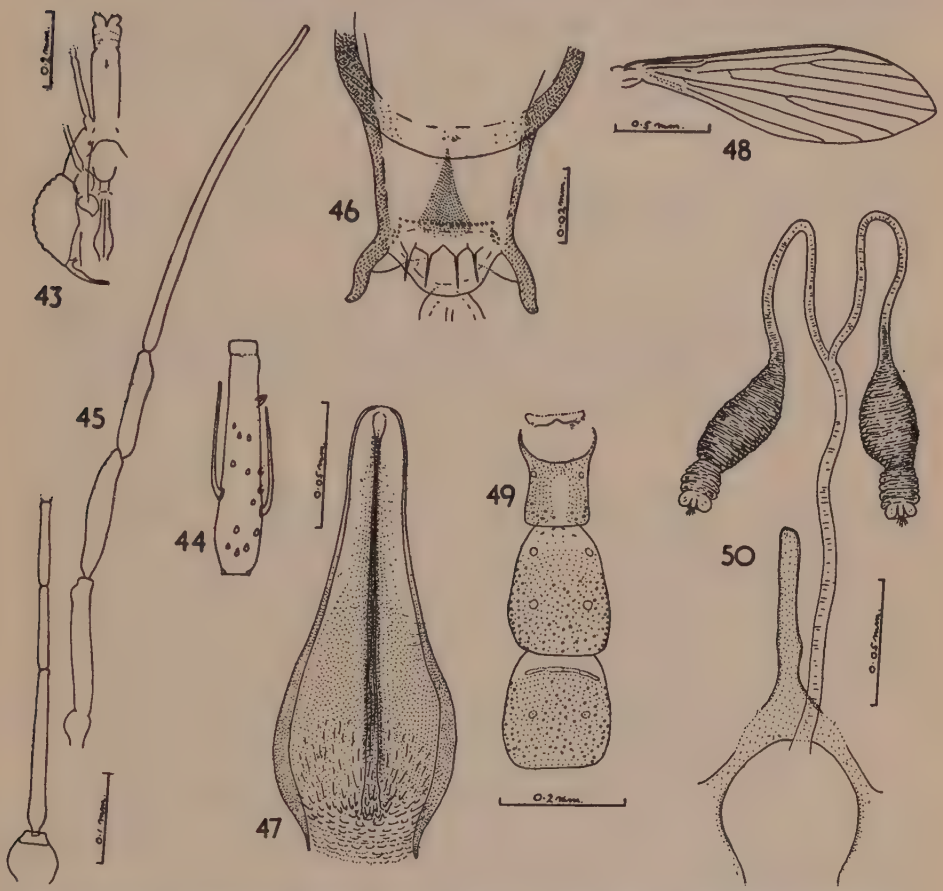
P. cruciatus is very similar to *P. diabolicus* Hall, according to Fairchild and Hertig (1953), but there seems little doubt that the present identification as *P. cruciatus* is correct. The vertical teeth of all the specimens were counted and found to range from 13 to 23 and to average 16. Often when there were few teeth they were small and unlike the few teeth characteristic of *P. diabolicus*. The number of small teeth is often an indefinite character because some may be too small to count or may merge into horizontal teeth. The number of annulations in the spermatheca appeared to vary from about 14 to 20, but the numbers could seldom be counted because the organ shrinks readily in this species and because several specimens had been dissected so that they could be examined for parasites.

Localities : Cool Shade, 11.i, 4 ♀; Guacamallo, 17.i, 5 ♀; Sayab Camp, 15.i, 1 ♀; 16.i, 21 ♀.

Phlebotomus (*Brumptomyia*) *ovallesi* Ortiz (Figs. 43–50)

The male was described by Ortiz (1952, 1954).

A male and female were sent to Dr. Fairchild who replied that they appeared



Figs. 43–50.—*Phlebotomus ovallesi* Ortiz. (43) ♀, head ; (44) fourth antennal segment ; (45) palp ; (46) cibarium ; (47) pharynx ; (48) wing ; (49) first four abdominal sternites ; (50) spermathecae.

to be this species, and suggested that we should describe the female. The description follows.

Female. Ascoids present on all flagellar segments of antenna except the last ; those on fourth half its length. Fifth segment of palp nearly as long as the rest combined ; Newstead's spines on third segment scattered. Chitinous arch conspicuous and flared at the sides. Cibarium narrow with rather pale but definite pigment patch ; a regular row of vertical teeth with a few in a group at each side ; four long horizontal teeth ; pharynx

pigmented, with thick walls; in its posterior half, longitudinal ridges merging into horizontal ridges, replaced posteriorly by faint rows of minute spicules.

Mesonotum dark and thoracic pleura pale. Wing length 1·70 to 1·84 mm. (11 measured, average 1·77).

Second to fourth abdominal sternites as figured. Spermathecae with small non-projecting knob and numerous folds, those near the knob, about 6, demarcated by a constriction from the rest of spermatheca; ducts delicate, the individual ones about 1·7 times length of spermatheca, common one about 1·5 times length of individual ones.

Male. Wing length 1·59 mm. (4 measured, 1·45–1·70 mm.).

Localities: Cool Shade, 11.i, 3 ♀; Guacamallo, 10.i, 3 ♂; 17.i, 5 ♀; Sayab Camp, 15.i, 1 ♂; 16.i, 5 ♀.

Summary

Fourteen species of *Phlebotomus* are recorded from British Honduras, with their known localities, and taxonomic observations are reported.

Acknowledgments

Our thanks are due to Dr. E. Losonczi, Dr. B. Gulyassy, Mr. J. E. Gallego and Mr. A. L. A. Wolffsohn for facilities to make the collections; and to Dr. G. B. Fairchild, of the Gorgas Memorial Laboratory, Panama, for generous advice on the taxonomy of the American *Phlebotomus*.

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Book Notice

Annual Review of Entomology. Edited by E. A. Steinhaus. Vol. 4. 8vo. Palo Alto, California (Annual Reviews Inc.), 1959. Pp. vii, 467, text illust. Price $7.50.

The fourth volume of this *Review* contains 19 papers dealing with the following subjects :

Insect blood cells, V. B. Wigglesworth.
Culture of insect tissues, M. F. Day and T. D. C. Grace.
Pheromones (*Ectohormones*) *in insects*, P. Karlson and A. Butenandt.
Insect pigments, R. I. T. Cromartie.
Taxonomic problems with closely related species, W. J. Brown.
Ecology of Cerambycidae, E. G. Linsley.
Biology of aphids, J. S. Kennedy and H. L. G. Stroyan.
The biology of parasitic Hymenoptera, R. L. Doutt.
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Ethological studies of insect behaviour, G. P. Baerends.
Experimental host-parasite populations, T. Burnett.
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Microbial control of insect pests, Y. Tanada.
On the mode of action of insecticides, F. P. W. Winteringham and S. E. Lewis.
Biological assay of insecticide residues, S. Nagasawa.
Deciduous fruit insects and their control, M. M. Barnes.
Seed treatment as a method of insect control, W. H. Lange, Jr.
Fleas and disease, W. L. Jellison.
Insects and the epidemiology of malaria, P. F. Russell.

The volume follows the same plan as the previous ones ; each article has a list of references to the literature cited in it, and there are author and subject indices at the end of the volume.

FURTHER STUDIES ON THE FENUSINI (HYMENOPTERA: TENTHREDINIDAE)

By Robert B. Benson

(*British Museum (Natural History)*)

In 1941 I reorganised the generic classification of the European leaf-mining sawflies of the tribe Fenusini (Tenthredinidae, Blennocampinae). Since then Ross (1951) has already re-arranged the North American species accordingly. The purpose of the present paper is to consolidate this classification and to extend it to cover the rest of the described species in the world, bearing in mind that those of Asia have scarcely yet been explored.

The work on which this paper is based became possible only through the kindness of the following, who allowed me to examine certain of the types in their charge: Dr. F. Kühlhorn (München), for the type of *Messa javana* Enslin from Java; Dr. R. Malaise (Stockholm) for the type of *Entodecta impropria* Malaise from East Siberia; Dr. H. Sachtleben (Berlin) for the types of *Scolioneura surosa* Konow from Chile, *Fenusa steusloffi* Konow from Germany, and *Entodecta beckeri* Konow from the Caucasus (= *Metallus beckeri* (Konow) **comb. nov.**); and finally, when I was in America in 1956, Dr. H. H. Ross for the Fenusine types of MacGillivray at Urbana, Illinois, and Dr. J. Gates Clarke and the authorities of the United States National Museum, Washington, for the type of *Messa alaskana* Kincaid from Alaska.

Metallus steusloffi (Konow) **comb. nov.**

Fenusa steusloffi Konow, 1891, *Dtsch. ent. Z.* **1891**: 213.
Fenusella steusloffi (Konow) Enslin, 1914, *Dtsch. ent. Z., Beih.* **1914**: 306.

The material of this species in Konow's collection consists of a single pair taken at Neu Brandenburg at flowers of sloe (*Prunus* sp.) in the spring. I have selected the female of this pair as the lectotype and have labelled it accordingly.

The species runs to *Metallus* in my 1941 key, differing, however, from all the previously known species of the genus in that vein M of the fore wing is almost entirely straight. If *Prunus* proves to be the foodplant of the species, as would seem likely, it is interesting that all the other members of the genus whose hostplants are known are also all from Rosaceae: four from *Rubus* and one from *Geum*.

Messa wüstneii (Konow)

Fenusa wüstneii Konow, 1894, *Wien. ent. Ztg.* **13**: 91.
F. alaskana Kincaid, 1900, *Proc. Wash. Acad. Sci.* **2**: 345, **syn. nov.**
Fenusella wüstneii (Konow) Enslin, 1914, *Dtsch. ent. Z., Beih.* **1914**: 305.
F. wüstneii (Konow) Hering, 1957, *Blattminen Europa*: 927.

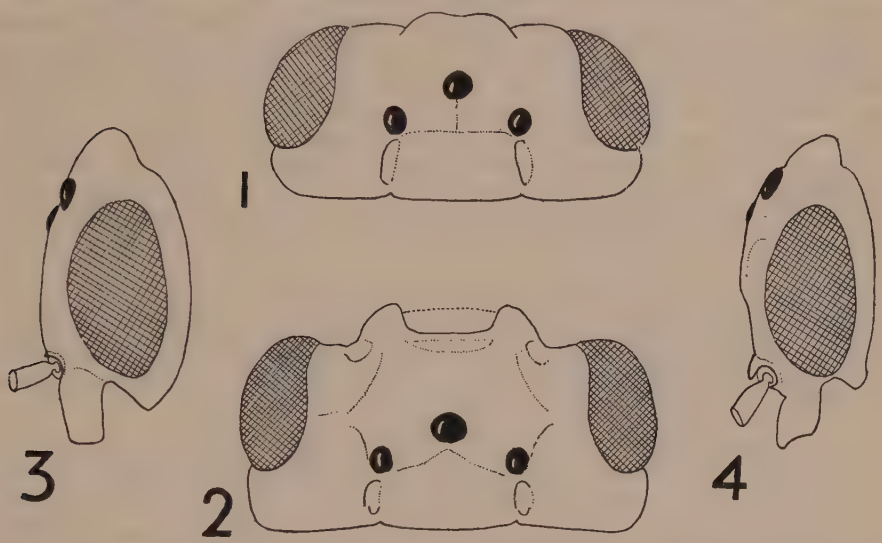
This species, according to Hering, mines the leaves of *Salix viminalis* L. and *S. incana* Schrank in Central Europe but is commoner in the Arctic, where in Swedish Lapland it was found by Malaise mining the leaves of *S. lapponum* L. Actually it is a circumpolar species; I have myself collected it both in Swedish Lapland in 1954 and in Northern Canada (Churchill, Manitoba) in 1956. The type of *Fenusa alaskana* Kincaid was from Kukak Bay in Alaska, but in the Canadian

National Collections at Ottawa there are specimens also from Baffin Island (Lake Harbour, viii.1935, (*W. J. Brown*)) and North West Territory (Coppermine, vii.1957 (*S. D. Hicks*)). Which species of *Salix* it attacks in North America have not yet been discovered.

Profenusa thomsoni (Konow)

Fenusa thomsoni Konow, 1886, *Wien. ent. Ztg.* **5** : 270.
Fenusella thomsoni (Konow) Enslin, 1914, *Dtsch. ent. Z., Beih.* **1914** : 306.
Messa alumna MacGillivray, 1923, *Ill. Univ. Bull.* **20** (50) : 23, **syn. nov.**
Profenusa thomsoni (Konow) Benson, 1941, *Proc. R. ent. Soc. Lond.* (B) **10** : 88.

This species, which mines the leaves of *Betula*, has been found in Europe only sparingly and is now holarctic in distribution ; not only have I seen material



Figs. 1–2.—Head from above to show antennal crests : (1) *Profenusa thomsoni ;* (2) *Notofenusa surosa.*

Figs. 3–4.—Head in profile : (3) *Profenusa thomsoni ;* (4) *Notofenusa surosa.*

from Japan, but my wife found it in prodigious quantities in July 1956 in North America at Madeline Lake, Oniedo County, Wisconsin, where its enormous abundance suggested an absence of natural enemies and perhaps an alien origin. So far it appears to be entirely parthenogenetic as no males have been found.

Notofenusa gen. n.

Antenna 9-segmented, longer than breadth of head and with second segment more than twice as long as broad. Head without genal carina but with conspicuously produced antennal crests which in dorsal view conceal the radicle of the first antennal segment (fig. 2) ; clypeus subtruncate in front ; eyes converge in front but are nevertheless further apart there than the longest measure of an eye. Thorax normal. Legs with hind tarsus shorter than tibia, which is swollen and has apical spurs shorter than its apical breadth ; tarsal claws with a large angular basal lobe. Wings as in *Profenusa* except that enclosed apical portion of anal cell of fore wing is longer than basal sector of AI (*c.* 6 : 4·5). Abdomen normal. Whole insect shining with surface sculpture obsolete.

Type species : *Scolioneura surosa* Konow, 1905, *Z. Syst. Hym. Dipt.* **5** : 162, from Chile = *Notofenusa surosa* (Konow), **comb. nov.** Two further specimens in the British Museum are from the ARGENTINE : Terr. Rio Negro, Bariloche, 1 ♀, xi–xii, 1926 (*F. and M. Edwards*) ; and Tierra del Fuego, Estancia Viamonte, 1 ♀, 1931 (*P. W. Reynolds*).

In the key to genera in Benson (1941) this genus would run to *Profenusa* (couplet 5), from which it is at once distinguished by its conspicuously produced antennal crests (which are very slight in all other known Fenusini) (*cf.* figs. 1 and 2) and by the long enclosed part of the anal cell of the fore wing (in all other Fenusini the enclosed part of the anal cell is shorter than the basal sector of A1).

Anafenusa gen. n.

Antenna 9- to 10-segmented, with flagellum about as long as width of head and second segment more than twice as long as broad. Head without genal carina ; clypeus subtruncate ; antennal crests small ; eyes with inner margins subparallel and further apart in front than the longest measure of an eye. Thorax normal. Legs with hind tarsus shorter than tibia, which is swollen and has very short apical spurs only about half as long as apical width of tibia ; tarsal claw long, curved and simple without any basal lobe. Wings (see fig. 19*a* in Malaise, 1931) as in *Profenusa* except that, in the fore wing, the stigma is less than twice as long as broad and M is almost straight. Abdomen normal. Whole insect shining with obsolete surface sculpture.

Type species : *Entodecta impropria* Malaise, 1931, *Ent. Tidskr.* **51** : 145–6, fig. 19 *a–d*, THE MARITIME PROVINCE OF EAST SIBERIA : Sedanka. = *Anafenusa impropria* (Malaise) **comb. nov.** Also to the genus belongs *Messa javana* Enslin, 1912, *Tijdschr. Ent.* **55** : 124, from JAVA : Depok, alt. 95 m. = *Anafenusa javana* (Enslin) **comb. nov.**

In the key to genera in Benson (1941) this genus would run to couplet 7 but it differs from *Silliana* Malaise, 1949 (= *Syringophilus* Hering, 1934 *nec* Heller, 1880) as well as from *Fenusa* and *Fenella* in having, in the fore wing, the basal stub of A3 straight and not converging towards A1 and M almost straight. From *Profenusa* it differs, apart from its entirely different claws, in its straight vein M and its very broad stigma.

Nefusa Ross, 1951, would also run in the key in Benson (1941) to *Profenusa*, from which it differs in having a prepectus to the mesepimeron, in the form of a raised front margin, and in having longer tibial spurs, about as long as the apical breadth of the hind tibia. I do not consider these characters justify the erection of the new tribe Nefusini for this genus, especially as a prepectus also occurs in the genera *Parna* Benson and *Hinatara* Benson (of the Fenusini), which are neither specially closely related to each other nor to *Nefusa*.

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REVISION OF THE EUROPEAN SAWFLIES OF THE *TENTHREDO ARCUATA-SCHAEFFERI* COMPLEX (HYMENOPTERA : TENTHREDINIDAE)

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The purpose of this paper was primarily to make known the discovery in the Central Italian Apennine Mountains of still another species of the *Tenthredo arcuata-schaefferi* complex. The study, of which this paper is the outcome, was thus originally merely a comparison between the new species and those already known. This naturally included species not occurring in Europe, though, as it turned out, none of these were found to be at all likely to be confused with the European members of the complex. *Tenthredo calvaria* Enslin, for example, from East Asia, has a very much shorter malar space, even in the female less than a sixth as long as the distance between the antennal sockets, besides its different colour pattern. Furthermore other Asiatic and North American species can all be excluded either because they possess a strong protuberance on the mesopleura, or because the antenna is reduced in length and number of segments to less than nine. There are very likely further species in the complex to be found in the mountains of Central Asia, and there may even be some already described from this region which I have failed to recognize from their descriptions as belonging to this complex.

Definition.—The complex can be defined as those species of *Tenthredo* with obsolete antennal crests, short clavate antennae, male claws without a basal tooth, and yellow-banded abdomens in which the yellow bands expand laterally. The species would run to *Allantus devius*, *brevicornis*, *arcuatus* or *schaefferi* in Enslin's monograph of 1911. Benson (1940, 1950 and 1952), and Pasteels (1951 and 1952), have already contributed recently to the taxonomic study of this complex.

Taxonomy and ecology.—In the keys presented below less emphasis is laid on the shape of the female hypopygium than in 1940 and 1950, because, apart from variation, this is liable to distortion in drying and to tearing in pairing. The saws show good distinguishing characters between some of the species, but the very similar saws of, for example, *Tenthredo acerrima* and *umbrica*, do not apparently indicate that these two species are necessarily very closely related.

Previously it has been found difficult to use the absolute length of the malar space as a distinguishing character. This difficulty has now been overcome by comparing the malar space with the distance between the antennal sockets. The proportion between these two measurements gives a ratio, often different between the sexes, but apparently independent of the animal's size.

In *Tenthredo arcuata* itself, however, there is a complication. In Central Europe there is a high alpine race, occurring mostly above the tree-line. This

alpine race, *T. arcuata aegra*, has a much longer malar space than the lowland *T. arcuata arcuata*, besides being generally darker, longer haired and more heavily sculptured. Occasionally specimens have been found intermediate between the two races in length of malar space and other characters (Pasteels, 1951), and this is taken here to mean that the two races are not yet sufficiently distinct genetically to be intersterile: they are in fact subspecies and not true species. It is presumed that this alpine race evolved under ecological conditions similar to those now occurring in the alpine meadows above the forest in Central Europe, and it was thus originally isolated from the lowland race associated with open grasslands in the valleys and deciduous forest. But a thinning of the forest has led to a partial breaking down of the barrier and occasional intermingling of the alpine and lowland races. In clearings in the subarctic forest near the tree-line in Scandinavia and right across northern Siberia to Alaska occurs another species, *T. devia*. I have collected this species in Swedish Lapland (common on the railway bank at Abisko) and have examined specimens from the Ural Mountains, Kamtchatka and Popov Island, Alaska. In the collections I have examined there has been considerable confusion between the subarctic *T. devia* and the alpine *T. arcuata aegra*, and it would be interesting to know more about the distribution of the two forms in the mountains of Central Asia.

The relationship between *T. schaefferi* and *perkinsi* is uncertain. In 1940 Benson distinguished *T. perkinsi* from *arcuata* with which it had previously been confused, but whether it is specifically distinct from *schaefferi* is problematical. The fact remains that no structural differences have yet been found between them and the males are as yet indistinguishable. Furthermore the female character correlations shown in the key below occasionally break down, and specimens occur which it is difficult to assign to either species because the dark colour of the legs is intermediate between brown and black. The status of the two forms thus requires genetical investigation, and for the present I have decided to treat them as no more than colour phases of one and the same species.

Biological and genetical studies.—*T. acerrima* was reared many years ago by Miss Chawner on *Lotus corniculatus* L. More recently, and quite independently of each other, both Dr. V. H. Chambers and Dr. F. Waterhouse have rediscovered this association. The same three workers each also found that *T. arcuata* and *T. schaefferi* f. *perkinsi* are associated in Britain with *Trifolium repens* L.

Waterhouse and Sanderson (1958), who have been working intensively on the biology and genetics of these three species, have found that both *T. acerrima* and *schaefferi* f. *perkinsi* show polymorphism. They find that *T. arcuata* has a haploid chromosome number of 15 and diploid of 30, those of *T. schaefferi* f. *perkinsi* being 18 and 36. *T. acerrima* appears to be variable cytologically as well as physiologically; and, although the chromosome numbers are usually 18 and 36, one brood was found with 21 and 42, the highest chromosome numbers yet recorded for a sawfly. Interbreeding between the two strains produced viable offspring with intermediate chromosome numbers. The parents of the two strains were collected together in the same locality, and neither they nor their offspring have been found to show any external character by which they can be distinguished from each other. It is much to

be hoped that in their future studies these workers will be able to investigate the genetics of typical *T. schaefferi* in comparison with its form *perkinsi*.

Aberrational names.—Numerous names have in the past been given to colour aberrations of *T. arcuata* sens. lat. But, as holotypes have often not been selected, it is impossible to tell now to which species in the complex the names rightly belong, as parallel colour forms occur in several of them. The darkest forms, for example, of *arcuata arcuata*, *arcuata aegra*, *acerrima*, *devia*, and *schaefferi* f. *perkinsi* are not known to be distinguishable from each other on colour; and the type of *Allantus brevicornis* var. *nigripleuris* Enslin from the Ural Mountains actually belongs to *Tenthredo jakutensis* Konow, distinguishable among other things by its almost entire female hypopygium.

Acknowledgments

I am indebted to Prof. Dr. Sandro Rufo of Verona for sending me examples of the most interesting new species from the central Apennines of Italy, to Dr. Ceballos of Madrid for lending me material from the Pyrenees and to Dr. Kühlhorn of München for lending me the rich material under his care from Dr. Enslin's and other collections, including some from the Ural Mountains, the Elburz Mountains of North Persia, the Caucasus, and the Transylvanian Alps, as well as from many parts of Central Europe.

Key to Females

1 Hypopygium behind sharply excised each side of middle (fig. 1). Hind tibia and tarsus marked apically with black. First tergite more or less black apically, but often with a yellow apical band which is constricted laterally. Downturned portion of each tergite almost entirely yellow so that abdomen has a pale lateral band. Head scarcely swollen behind eyes. Scutellum, tegula and first antennal segment often marked with yellow 2

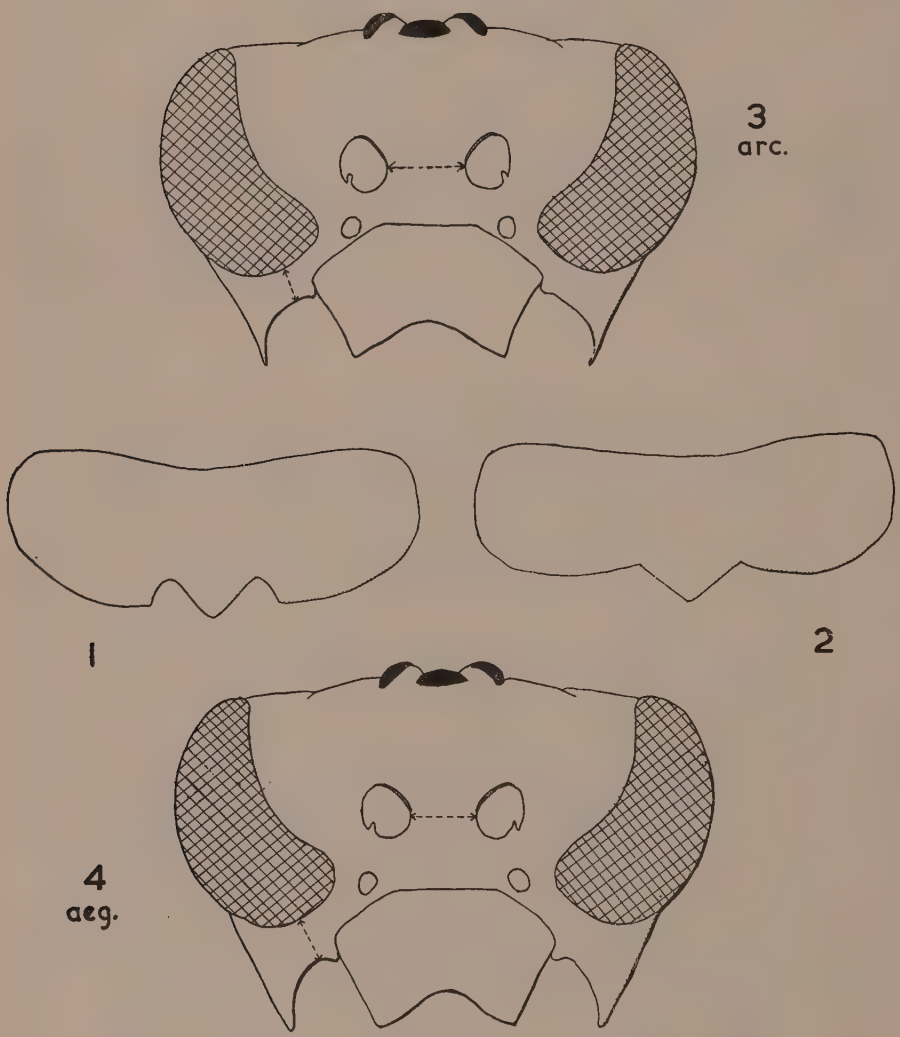
– Either hypopygium behind evenly emarginate each side of middle (fig. 2), or middle and hind tarsi marked apically with reddish-brown instead of black. First tergite often entirely yellow or with a broad yellow apical continuous band that is never constricted laterally 3

2 (1) Saw with blunt teeth (fig. 5). 8–11 mm. In the lowland subspecies, *arcuata arcuata* (Förster), the malar space about half distance between antennal sockets (fig. 3); in the more heavily sculptured and longer haired alpine subspecies, *arcuata aegra* (Enslin) (= *brevicornis* Konow), found at or above the tree line in Central Europe, the malar space about two-thirds distance between antennal sockets (fig. 4); the antenna, through the shortening and fusing of the apical segments, often only 8-segmented; and tegula, pronotum and mesopleura mostly black. (It would seem, however, that intermediate forms occasionally occur in the intervening areas.)

Larva on Trifolium repens *L. Britain, Belgium, Holland, France, N. Spain, N. Italy, Switzerland, Germany, Austria, Czechoslovakia, Poland, S. Norway, S. Sweden, Russia, Siberia and ? Japan. The alpine subspecies* arcuata aegra *has been found in the*

Pyrenees, the Alps of France, Switzerland, Germany, Austria, Yugoslavia, as well as the Transylvanian Alps in Rumania
arcuata Förster

– Saw with sharp teeth (fig. 11). 8–11 mm. Malar space about half distance between antennal sockets.
Larva on Lotus corniculatus *L. Britain, Belgium, Holland, France, N. Spain, N. Italy, Switzerland, Germany, Austria and Yugoslavia*
= *sulphuripes* Kriechbaumer Benson, 1940, nec Kriechbaumer) **acerrima** Benson



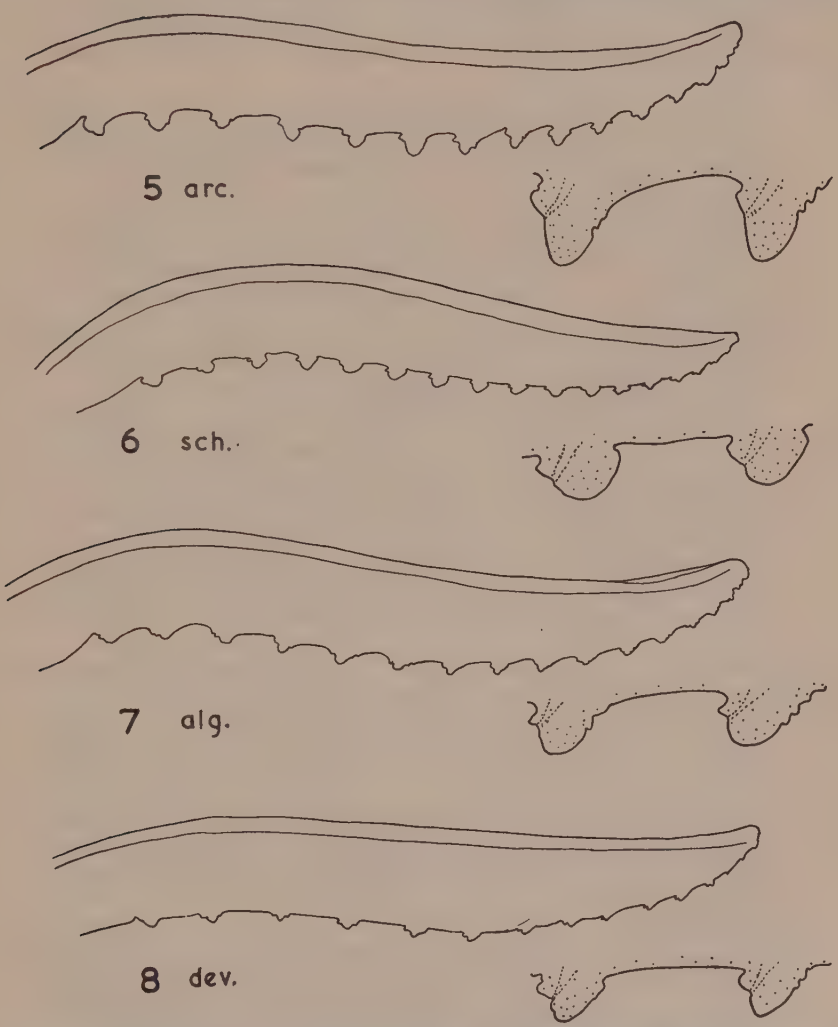
FIGS. 1–4.—(1) and (2) Hypopygium of female *Tenthredo :* (1) *arcuata ;* (2) *schaefferi.* (3) and (4) Face to show malar space compared to distance between antennal sockets in : (3) *arcuata arcuata ;* (4) *arcuata aegra.*

3 (1) Tibiae and/or femora black marked. First antennal segment often with its girth less than distance between antennal sockets; antennal crests (on upper margin of antennal socket) not raised above middle of area between them. Saw with more prominent teeth (figs. 6–8 and 10) 4

– All tibiae and femora yellowish-white marked with, at most, reddish-brown apically; without any black flecks. First antennal segment enlarged so that its girth is greater than distance between antennal sockets; antennal crests enlarged so that area between them is concave. Saw with very shallow teeth (fig. 9).

Malar space about two-fifths distance between antennal sockets. First tergite mainly yellow. 8–9 mm.

Austria and Switzerland . . (nec *sulphuripes* Kriechbaumer Benson, 1940, *beaumonti* Benson, 1950) **sulphuripes** (Kriechbaumer)



Figs. 5–8.—Outline of saw in *Tenthredo* spp., with enlarged tenth and eleventh tooth from apex, in: (5) *arcuata*; (6) *schaefferi*; (7) *algoviensis*; (8) *devia*.

4 (3) Either first tergite mainly yellow, or head not contracted behind. Antenna 9-segmented. Saw with larger teeth (figs. 6, 7 or 10). Temperate or montane species 5

– First tergite mainly black, only more or less yellow on hind and lateral margins. Head contracted behind eyes in dorsal view. Antenna with apical segments shortened and more or less fused, so that it is usually but 8- or 7-segmented, with third usually longer than apical segments beyond the fifth. Saw with smaller teeth (fig. 8). Subarctic. 8–11 mm.
Malar space about half distance between antennal sockets.
Lapland, N. Russia, N. Siberia to Kamtchatka and Japan, Aleutian Islands to Popof Island, Alaska
(*heraclei* Kincaid, *alaskana* Enslin, **Syn. nov.**) **devia** (Konow)

5 (4) Malar space about two-thirds as long as distance between antennal sockets. Saw as in figs. 7 or 11 6

– Malar space not more than half as long as distance between antennal sockets. Saw as in fig. 6 7

6 (5) Hind tibia and tarsal segments marked apically with reddish-brown instead of black. Saw with blunter teeth (fig. 7). Inner hind tibial spur at least half as long as basitarsus. Scutellum entirely black. 10–13 mm.
Superficially very similar to schaefferi, *but lacks pale scutellum. Subalpine species of forest clearings between* 1000 *and* 1700 *m. in E. Pyrenees, France, Switzerland, Austria and Transylvanian Alps of Rumania* . . (*schaefferi* var. *algoviensis* Enslin) **algoviensis** (Enslin)

– Hind tibia and tarsal segments black-marked apically. Saw with sharper teeth (fig. 10). Inner hind tibial spur less than half basitarsus. Scutellum marked with yellow. 10–12 mm.
Apennine Mountains of Central Italy . . . . . **umbrica** sp. n.

7 (5) Apart from first tergite, more than two often continuously margined or banded apically with yellow, and fourth and fifth each with less than apical half yellow. Antenna with seventh segment often broader than long 8

– Apart from first tergite, only fourth and fifth continuously banded with yellow, the yellow usually occupying apical two-thirds. Antenna with seventh segment usually longer than broad. 10–13 mm.
Pyrenees . . (*arcuatus* var. *largiflavus* Enslin) **largiflava** (Enslin)

8 (7) Sternites of abdomen with broad black basal bands. Tibial spurs shorter (inner spur of hind tibia less than half length of basitarsus). Malar space about half distance between antennal sockets . . . . . (forms of *schaefferi* Klug) 9

– Underside of abdomen almost entirely lemon yellow. Tibial spurs longer (inner spur on hind tibia more than half length of basitarsus). Malar space about two-fifths distance between antennal sockets. 9·5–10·5 mm.
Caucasus . . . . . **titania** sp. n.

9 (8) Downturned portion of each tergite with the black basal band continued to the edge, so that abdomen does not have a continuous pale lateral stripe. Hind tibia and tarsus yellow, marked only with brown. Wings slightly yellowish with R of fore wing

(*i.e.* hind half of Sc + R) yellow in Central European lowlands but piceous in Alpine and Northern Regions. 10–13 mm.
Typical form : England, France, Belgium, Holland, Switzerland, Germany, Austria and Transylvania . . . . . **schaefferi** Klug

– Downturned lateral portions of at least each of middle tergites entirely or almost entirely yellow, so that abdomen has a pale lateral longitudinal stripe. Hind tibia and tarsus yellow with conspicuous black flecks above. Wings mainly hyaline with R of fore wing piceous. 10–13 mm.
(Specimens from the high alps of Central Europe and Elburz Mountains of N. Persia have the first tergite infuscate laterally or even entirely.) *Larva on* Trifolium repens. *L. Actually more common and widespread than the "typical" form. Britain, France, Holland, Belgium, N. Spain, Switzerland, Germany, Austria, S. Sweden, Poland, Jugoslavia, Macedonia and N. Persia* (*Elburz Mountains*, 2500–3200 *m.*, 19–22.vii.1937 (*E. Pfeiffer and W. Forster*)) . . . . . **schaefferi** forma **perkinsi** (Morice)

Key to Males

1 Brush beneath hind tarsus pale brown 2
– Brush beneath hind tarsus black at least on inner side 4
2 (1) Inner spur of middle and hind tibia less than half as long as basitarsus.
Europe 3
– Inner spur of all tibiae half or more than half as long as basitarsus. 10 mm.
Caucasus . . . . . **titania** sp. n.
3 (2) Eyes less converging in front so that length of overlap of an eye on hind margin of clypeus is much less than distance between antennal sockets (*c.* two-thirds). Front and middle femora entirely yellow. Malar space about one-third distance between antennal sockets. 8 mm.
C. European Mountains . . . . **sulphuripes** (Kriechbaumer)
– Eyes more converging in front so that length of overlap of an eye on hind margin of clypeus is about equal to distance between antennal sockets. Front and middle femora may be entirely yellow or more or less lined with black. 8–11 mm.
(In lowland forms in both species the malar space is about one-third the distance between the antennal sockets. In the high alpine *arcuata aegra* Enslin the malar space is up to about a half the distance between the antennal sockets and the pronotum, tegula, and mesopleura are all black, but intermediates between the two forms of *arcuata* occasionally occur.)
acerrima Benson and **arcuata** Förster
4 (1) Two front pairs of legs at least partly lined with black above on tibiae and tarsi. Fourth and fifth tergites of abdomen with at most only a thin apical yellow margin medially. Scutellum mostly black. 5
– Two front pairs of legs entirely yellow with only reddish-brown markings above. Fourth and fifth tergites of abdomen entirely yellow except for the narrow basal margin. Scutellum marked with yellow. Malar space about half as long as distance between antennal sockets. 10–13 mm.
Pyrenees . . . . . **largiflava** (Enslin)

5 (4) Antenna with 9 segments. Head not or scarcely contracted behind.
Temperate or alpine species 6

– Antenna with some apical segments more or less fused so that it is usually 8- or 7-segmented. Head strongly contracted behind eyes. 8–11 mm.
Subarctic species . . . . . **devia** (Konow)

6 (5) Malar space at most two-thirds as long as distance between antennal sockets. Antenna with eighth segment broader than long. Scutellum entirely black 7

– Malar space almost as long as distance between antennal sockets (five-sixths). Antenna with eighth segment longer than broad. Scutellum with post-tergite pale. 11 mm.
Italy . . . . . **umbrica** sp. n.

7 (6) Malar space one-third as long as distance between antennal sockets. 10–13 mm. **schaefferi** Klug

– Malar space more than half as long as distance between antennal sockets. 10–13 mm.
Subalpine species of C. Europe . . . . . **algoviensis** (Enslin)

Tenthredo umbrica sp. n.

Female

Colour as in *T. schaefferi* f. *perkinsi*. Head, including antenna, black except for the yellow palps, mandibles, labrum and clypeus. Thorax black with yellow flecks on propleura, hind angles of pronotum, tegula, middle of scutellum and its post-tergite; small fleck posteriorly on mesosternum, likewise on mesosternum, also metapleura. Legs yellow with coxae and trochanters mainly black, hind and middle femora lined with black above, all tibiae at their apices above, and tarsal segments more or less lined above. Wings subhyaline; stigma, costa and subcosta of fore wing yellow; rest of venation brown. Abdomen black with the following parts yellow: first tergite except for extreme base, a fleck occupying more than half length of lateral and downturned portion of each tergite, and hind margins of tergites 4, 5 and 8, and sometimes also 3, 6 and 7.

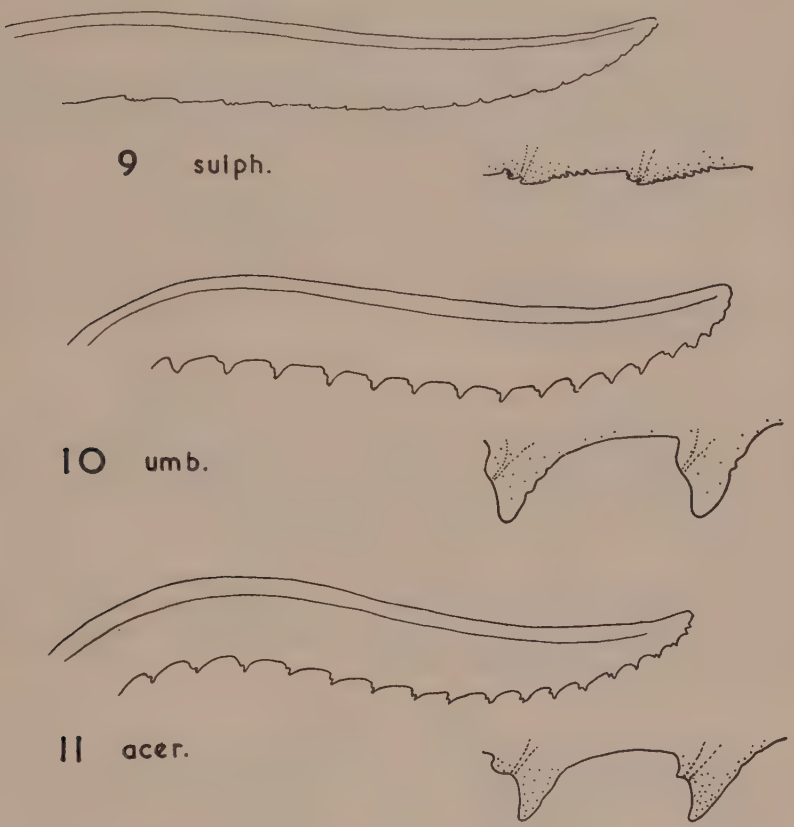
Head slightly expanding behind eyes, which converge in front to a distance of less than width of clypeus (1·0 : 1·1) and less than two-thirds longest dimension of an eye (1·0 : 1·5); malar space over two-thirds distance between antennal sockets (1·0 : 1·4). Clypeus roundly emarginate in front to a depth of about one-fourth the clypeal length. Antennal crests scarcely developed, so that the interantennal area from above is flat. Hind ocelli about as far apart as from the occipital carina. Punctation between eyes heavy and close with dull interspaces, but on temples and outer orbits widely spaced and shining between. Antenna longer than breadth of head (1·2 : 1·0); third segment shorter than sixth to ninth; sixth about as broad as long; seventh, eighth and ninth broader than long. Pubescence up to about as long as distance between antennal sockets and white.

Thorax shining between scattered punctures which are very shallow on mesoscutellum, becoming confluent on upper mesopleura. Pubescence on mesopleura about as long as diameter of a hind ocellus, stiff, and fuscous; on scutellum, mesopleura and sternum longer and white. Legs with spurs normal, inner hind tibial spur being less than half length of basitarsus.

Abdomen normal with dense alutaceous surface sculpture on tergites; hypopygium evenly emarginate behind each side of middle, as in *T. schaefferi* (fig. 2). Saw with very sharp teeth (fig. 10). *Length* 10–12 mm.

Male

As female except for sexual characters, and in that: mesoscutellum black, first tergite black above apart from narrow medial apical margin, and continuous pale apical margins occur only on tergites 3, 4 and 5, meso-episternum and mesosternum entirely black, the black on the legs more extensive, forming, for example, a continuous line above hind tibia and tarsus, abdomen below entirely pale, and antenna more slender with all flagellar segments, except apical one, longer than broad.



Figs. 9–11.—Outline of saw of *Tenthredo* spp., with enlarged tenth and eleventh tooth from apex, in: (9) *sulphuripes;* (10) *umbrica;* (11) *acerrima.*

Italy: Umbria, Mount Sibillini, vii. 1954, 2 ♀ (including holotype); 1 ♂, Pian Perduto (Verona Museum); 1 ♀, Forca Viola, and 1 ♀, Pian Grande (*S. Rufo*); (British Museum (Nat. Hist.)).

Tenthredo titania sp. n.

Female

Colour.—Head black with palps, mandibles (except for their tips), labrum, clypeus, first antennal segment, and outer apex of second, yellow. Thorax black richly marked with lemon yellow, which covers most of pronotum, tegula, mesoscutellum (except for its hind margin) and its post-tergite, a spot on meta-postnotum, a large fleck covering hind part of mesepisternum, hind half of mesepimeron and most of metapleura.

Legs mainly yellow with black flecks at extreme bases of coxae, trochanters behind, upper side of femora, upper side of apical half of tibiae and upper side of tarsi. Wings subhyaline; stigma, C and Sc of fore wing yellow; rest of venation brown. Abdomen almost entirely yellow below, but above with black basal margins to all tergites, broader medially than laterally, and reaching apex of tergite medially only on second and seventh segments.

Head slightly contracted behind eyes in dorsal view; eyes closer together in front than width of clypeus (1·0 : 1·2) or the longest measure of an eye (1·0 : 1·3). Malar space almost two-fifths as long as distance between antennal sockets (1·0 : 2·7). Clypeus with a shallow medial apical emargination of about one-fourth its length. Crests above antennal sockets scarcely developed so that inter-antennal area virtually flat in dorsal view. Hind ocelli closer together than from occipital carina (1·0 : 1·3). Punctation between eyes heavy and irregular with dull interspaces; but on temples and postocellar area shining areas present between punctures. Pubescence about as long as diameter of an ocellus, dark on frontal area, pale at sides.

Thorax with fine dense punctures and microsculpture between, though this becomes obsolete on mesoscutellum. Pubescence as on head, fuscous on mesonotum, pale elsewhere. Legs normal with long tibial spurs so that inner spur on hind leg more than half basitarsus (1·0 : 1·9). *Abdomen* normal, with dense alutaceous sculpture on tergites. Hypopygium evenly emarginate each side of middle, as in *T. schaefferi* Klug (fig. 2). Saw as in *T. schaefferi* (fig. 6). Length 9·5–10·5 mm.

Male

As female except for sexual characters, and in that the yellow colouring is less extensive on pronotum, and absent from postnotum, and tibiae and tarsi are lined above with black continuously; eyes more strongly converging below so that their distance apart in front compared with clypeal width is 1·0 : 1·3; malar space compared to distance between antennal sockets is 1·0 : 2·8; hind ocelli scarcely closer together than distance from occipital carina (1·0 : 1·1). Brush beneath hind tarsus brown. Length 10 mm.

Transcaucasia: Georgia, Akhaltsikh, 1885, 2 ♀ (including holotype); Borshom, 1 ♀; Svanetia inf., 17.vii. 1911, 1 ♂, (*A. Schelkovmikov*). (Holotype and paratypes from Borshom and Svanetia in Mus. München; paratype from Akhaltsikh in British Museum (Nat. Hist.)).

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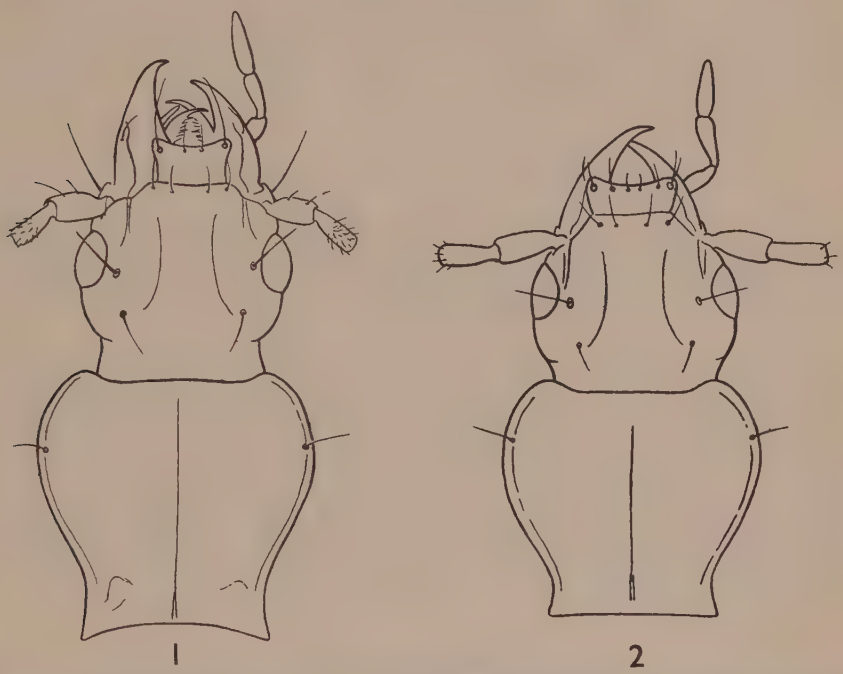
CARABIDAE (COLEOPTERA) FROM NEW ZEALAND CAVES

By E. B. Britton

(*Department of Entomology, British Museum (Natural History)*)

The expectation that the New Zealand Speleological Society would make further discoveries of cave Coleoptera (Britton, 1958) has been speedily fulfilled. Mrs. Brenda May has kindly sent material of two more species of Carabidae from caves in the Provincial District of Auckland. One of the new species belongs to the genus *Duvaliomimus* and was collected in Puriri Cave at Port Waikato, sixty miles south of Auckland. The other species from two caves



Figs. 1–2.—Head and pronotum of: (1) *Duvaliomimus styx* sp. n.; (2) *D. watti* Britton.

at Te Kuiti, one hundred and twenty-five miles south of Auckland, must be placed in a new genus of the Sphodrini in the subfamily Anchomeninae. The latter species is of special interest in that it appears to be the first sphodrine known from the southern hemisphere All Sphodrini previously known are Holarctic (mainly Palaearctic) in distribution. Neither species shows any special modification for life in caves.

Subfamily Trechinae

Duvaliomimus styx sp. n. (Fig. 1)

Length : 4·5–4·9 mm. *Colour :* head dark brown, pronotum and elytra shining black on the disc, margins dark brown ; antennae and mandibles reddish-brown, palpi yellowish-brown ; legs yellowish-brown, with femora and tibiae infuscate. *Head* (fig. 1) very similar to that in *D. watti* (fig. 2), the eyes slightly more prominent. *Pronotum* (fig. 1) less transverse than that in *D. watti* (fig. 2), ratio greatest width/middle length *c.* 1·12, posterior angles more attenuate and acute. *Elytra* more depressed than in *D. watti* ; outline ovoid, without trace of shoulder angles ; elytral striae equally impressed, intervals slightly convex, shining, without microsculpture.

Locality.—New Zealand : North Island, Port Waikato, Puriri Cave, 200–300 yards from entrance, on mud near stream, holotype ♂ and 4 paratypes ♀, 15.vi.58 (*Mrs. B. M. May*).

Deposition of Types : holotype and paratypes in the collection of the Plant Diseases Division, Department of Scientific and Industrial Research, Mount Albert, Auckland. Paratype in the British Museum (Nat. Hist.).

D. styx is the fifth species of the genus to be recognised. A key to the other four species is given in a revision of the genus published in these *Proceedings* (Britton, 1958 : 184).

Subfamily Anchomeninae (Agoninae)

The classification of Carabidae now generally adopted is Basilewsky's (1953) interpretation of the arrangement of Jeannel (1941–42, 1946–49). In this the subfamily Anchomeninae (Anchomenini in my key to the tribes of New Zealand Carabidae, 1940) is defined by the following characters :

One spur of the anterior tibia displaced to the proximal side of the cleaning organ (Anisochaeta) ; metepimera visible, in the form of a lobe attached to the posterior edge of the metepisterna ; mesepimera not reaching the middle coxal cavity ; parameres in the male without setae, at least one paramere conchoidal in form ; scrobe of mandible without a seta (Conchifera) ; mesotibiae spinose on the external face ; frons with two setiferous punctures above each eye ; posterior prothoracic setae usually present ; antennae usually pubescent from the fourth segment ; scutellar striole situated between the scutellum and the first stria, on interval 1 ; penultimate segment of the labial palp with two setae ; the longitudinal inner carina of the elytra not visible from the side beyond the apex of the epipleura.

Tribe Sphodrini

The genera (including *Calathus*, *Sphodrus* and *Laemostenus*) which are grouped in the tribe Sphodrini (" Sphodrides " of Jeannel, 1937), are clearly intermediate between the Pterostichinae and Anchomeninae. For this reason it matters little in which subfamily the tribe is placed, but for ease of identification there is some advantage in placing it with the Anchomeninae.

The Sphodrini then includes those Anchomeninae in which the posterior extremity of the prosternal intercoxal process is compressed into a vertical ridge. In the Sphodrini also the apical orifice of the aedeagus is displaced to the right.

FIGS. 3–4.—*Prosphodrus waltoni* gen. et sp. n.; (3) whole insect, ♂; (4) aedeagus.

Prosphodrus gen. n.

A New Zealand genus of Sphodrini with the following characters :—

Head strongly developed, about as large as the pronotum ; mandibles, maxillae and palpi elongate ; mentum with a bifid median tooth and a pit on each side of the middle near the base ; mesosternum without a tubercle in front of each middle coxa ; trochanters of the posterior legs obtusely rounded at their apices ; all segments of the posterior tarsi with recumbent setae beneath ; the third and fourth segments of the middle and posterior tibiae expanded to their apices, the fourth segments with their apical edges concave ; upper surfaces of the tarsi without setae or longitudinal grooves ; metatibiae without a brush of setae on the inner side towards the apex ; tarsal claws not pectinate.

The genus is most closely related to the *Sphodrus* group of genera (Jeannel, 1937), but distinguished from all by the poorly developed basal margin of the elytra which does not make an angle with the edge of the elytra, and by the fact that both parameres of the aedeagus are conchoidal. It is distinguished from *Sphodrus* by the fact that the posterior trochanters are obtuse, not pointed, from *Sphodropsis* by having segments 3 and 4 of the mid and hind tarsi broadly expanded and without longitudinal striae above, and from *Taphoxenus* by the presence of setae beneath the basal segment of the posterior tarsus.

Prosphodrus waltoni gen. et sp. n. (Figs. 3, 4)

Length : *c.* 16·0 mm. *Colour :* head, pronotum and elytra black ; ventral surface, femora and tibiae piceous, tarsi reddish-brown ; labrum and palpi reddish-brown. Form of *head*, *pronotum* and *elytra* as shown in figure 3. Elytral striae uniformly impressed except at the apex, the striae with very slight traces of puncturation. Elytral intervals moderately and uniformly convex ; surface of elytra shining, with faint, moderately transverse, reticulate microsculpture. Surface of pronotum shining, with strongly transverse, reticulate, microsculpture. Aedeagus as in figure 4.

Locality.—New Zealand : North Island, Te Kuiti, Waipuna Cave, 500 yards from entrance, on wall, 11.i.58 (*Mrs. B. M. May*), holotype ♂, Te Kuiti, Lemberg's Cave, 100 yards from entrance ; paratype ♀, 27.vii.57 (*F. Walton*).

Deposition of Types : holotype ♂ in the collection of the Plant Diseases Division, D.S.I.R., Mount Albert, Auckland ; paratype ♀ in the British Museum (Nat. Hist.).

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A NEW SPECIES OF *PSILA* MEIGEN (DIPTERA : PSILIDAE) FROM NORTHERN ENGLAND

By S. B. Wakerley

(*Department of Agricultural Zoology, King's College, University of Durham, Newcastle-upon-Tyne* 1)

During the course of research into the biology of the Psilidae in Northern England, a new species of the genus *Psila* Meigen was discovered and is described in this paper. The author wishes to acknowledge with thanks the invaluable help given by Dr. G. Heslop-Harrison, under whose supervision this work is being carried out.

Psila persimilis sp. n.

General features.—A comparatively small fly with a black body, reddish-brown head and yellow legs. The abdomen of the female is slightly larger than that of the male. Wing length : ♂ and ♀, 3·3–3·7 mm.

Colour : head reddish-brown with the ocelli located on a raised black spot which forms the anterior point of a triangular, darkened area extending over the occiput ; eyes dull red ; scape and pedicel reddish-brown ; third antennal segment darkened but not completely black (fig. 1*A*) ; clypeus varying from reddish-brown to dark brown ; palps and theca always reddish-brown. *Thorax*, with exception of prothorax, lustrous black with yellow membranous areas ; cervical sclerites, prothorax, and an adjacent small area of the mesothorax, red (the full extent of this area is shown in figure 1*B* (darkly stippled), but its colour may vary from completely black to red). *Legs* pale yellow. *Abdomen* glossy black.

Structure : hypopygium with large serrations on internal lateral margin ; claspers small tuberculate structures, and if turned outwards seen to be of a more or less rectangular shape ; basal part of aedeagus broad and V-shaped, whilst distal portion is short and very narrow (fig. 1*C*) ; three or four pairs of setae usually present on lateral margin of ninth sternite.

Chaetotaxy : head bearing 3 vertical, 1 postvertical, 2 orbital and 1 ocellar bristles ; *thorax* bearing 1 notopleural, 1 intra-alar, 1 supra-alar, 2 dorsocentral and 1 scutellar bristles.

Holotype ♂, Co. Durham : Crimdon Park, 31.vii.58.

Paratypes : 11 ♂, 8 ♀, type locality ; 1 ♂, 2 ♀, Northumberland : Hartford Bridge.

Holotype and paratypes in the author's possession. Paratypes have also been deposited in the British Museum (Nat. Hist.).

Habit.—Found in low vegetation and small shrubs such as privet (*Ligustrum vulgare* Linn.) and elder (*Sambucus nigra* Linn.). There appears to be only one annual generation, as no flies have been caught in the spring. The adult flies emerge in July and August.

Notes.—In view of the variation in colour of this new species, specimens may easily be confused with *P. rosae* Fab., *P. nigricornis* Mg. and *P. humeralis* Zett. It differs distinctly from them, however, in the structure of the aedeagus (fig. 1*E*) and claspers. The structure of the male genitalia is the most satisfactory guide to the correct determination of *P. persimilis*.

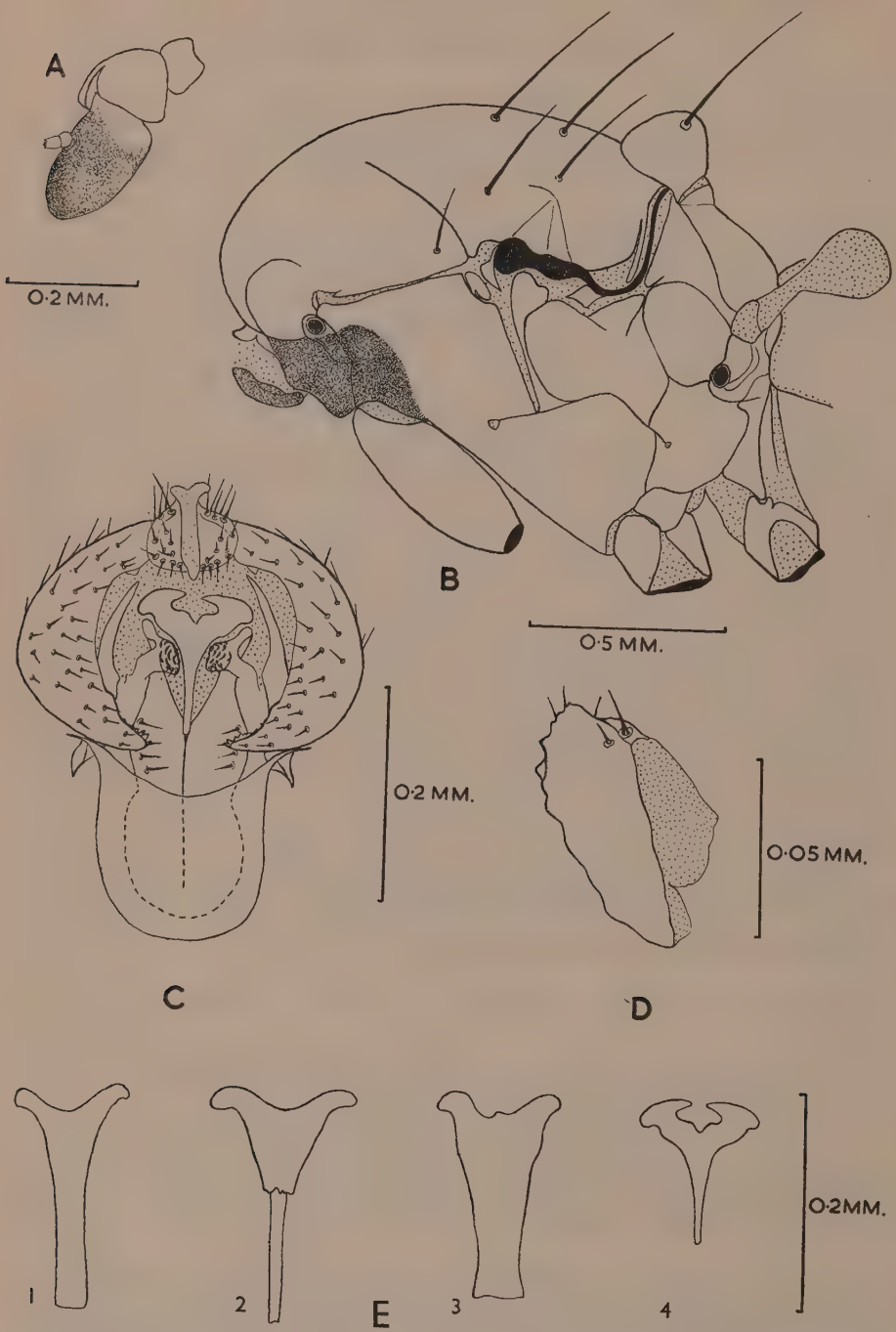

FIG. 1.—(*A–D*) *Psila persimilis* sp. n.: (*A*) antenna; (*B*) lateral view of the thorax; (*C*) male genitalia; (*D*) clasper (turned outwards). (*E*) Aedeagus of: (1) *P. rosae*; (2) *P. nigricornis*; (3) *P. humeralis*; (4) *P. persimilis*.

A NEW SPECIES OF *GAMPSOCORIS* FUSS (HEMIPTERA : BERYTIDAE) FROM DELHI

By Ramdas Menon and Swaraj Ghai

(*Division of Entomology, Indian Agricultural Research Institute, New Delhi*)

The Berytidae, also for some time known as Neididae, is a small family of heteropterous bugs related to the Coreidae. Members of this family can be readily distinguished by their apparently mosquito-like form with long slender legs, whose femora are apically dilated, and with long, slender somewhat geniculate antennae which have the first segment much elongated and also apically dilated.

Distant (1902), in his first volume on the rhynchotous fauna of India (including Pakistan, Ceylon and Burma), mentioned only three species from this region. Of these, *Gampsocoris pulchellus* (Dallas) (= *Metacanthus pulchellus* Dallas) and *Hubertiella cardamomi* Kirkaldy had already been recorded from India and Ceylon respectively ; the third species, *Paleologus feanus*, was described for the first time by him from Burma, being placed in a new genus. In this work Distant indicated that so meagre a record was certainly unlikely for this region and diligent collecting should bring to light several new forms. This statement was later substantiated by him (1907 and 1918), when he added five genera and several new species to his original list. It is interesting to note that no further addition to the Indian Berytid fauna has since been made.

While making a general collection of insects the authors had this in mind and kept a special watch for members of this group. This has brought to light a new species occurring with *Gampsocoris pulchellus* on the growing tips of the bottle-gourd plant (*Laginaria vulgaris*) in the Estate of the Indian Agricultural Research Institute, New Delhi. Opportunity is now taken to describe it below.

Gampsocoris delhiensis sp. n. (Fig. 2*a–e*)

Body (fig. 2*a*) long and narrow, light ochraceous, segments 2–4 of rostrum and last tarsal segments of all legs dark brown, antennal club almost black, with terminal one-fourth distinctly white (fig. 2*d*).

Head (fig. 2*b*) longer than broad, with a deep transverse sulcus behind eyes, glabrous under low magnification, but distinctly tuberculate when viewed under high magnification, the tubercles very short and rounded. Eyes laterally placed, hemispherical, close to bases of antennae. Ocelli placed laterally on slight tubercular swellings close behind the transverse sulcus. Antennae distinctly longer than body ; first segment the longest, but shorter than second and third together ; second longer than third ; terminal segment dilated, elongate-oval, a little less than a fourth as broad as long, forming a distinct club ; a very short and rudimentary fourth segment clearly discernible at base of club ; first to third segments with distantly-placed short hairs arising from short cuticular projections ; club more densely hairy. Rostrum reaching bases of metacoxae.

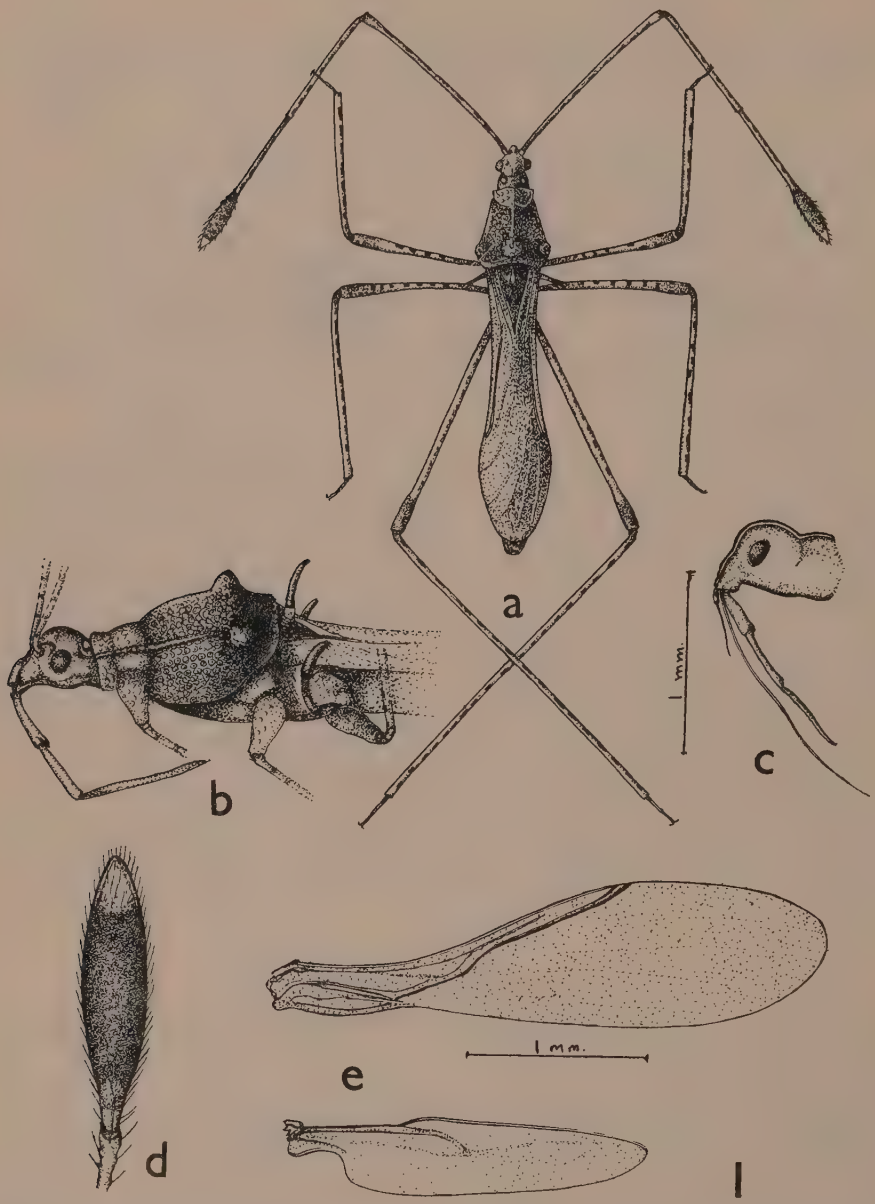

FIG. 1.—*Gampsocoris pulchellus* (Dallas): (*a*) adult (dorsal view); (*b*) head and thorax (lateral view); (*c*) head with rostrum (lateral view); (*d*) antennal club; (*e*) wings.

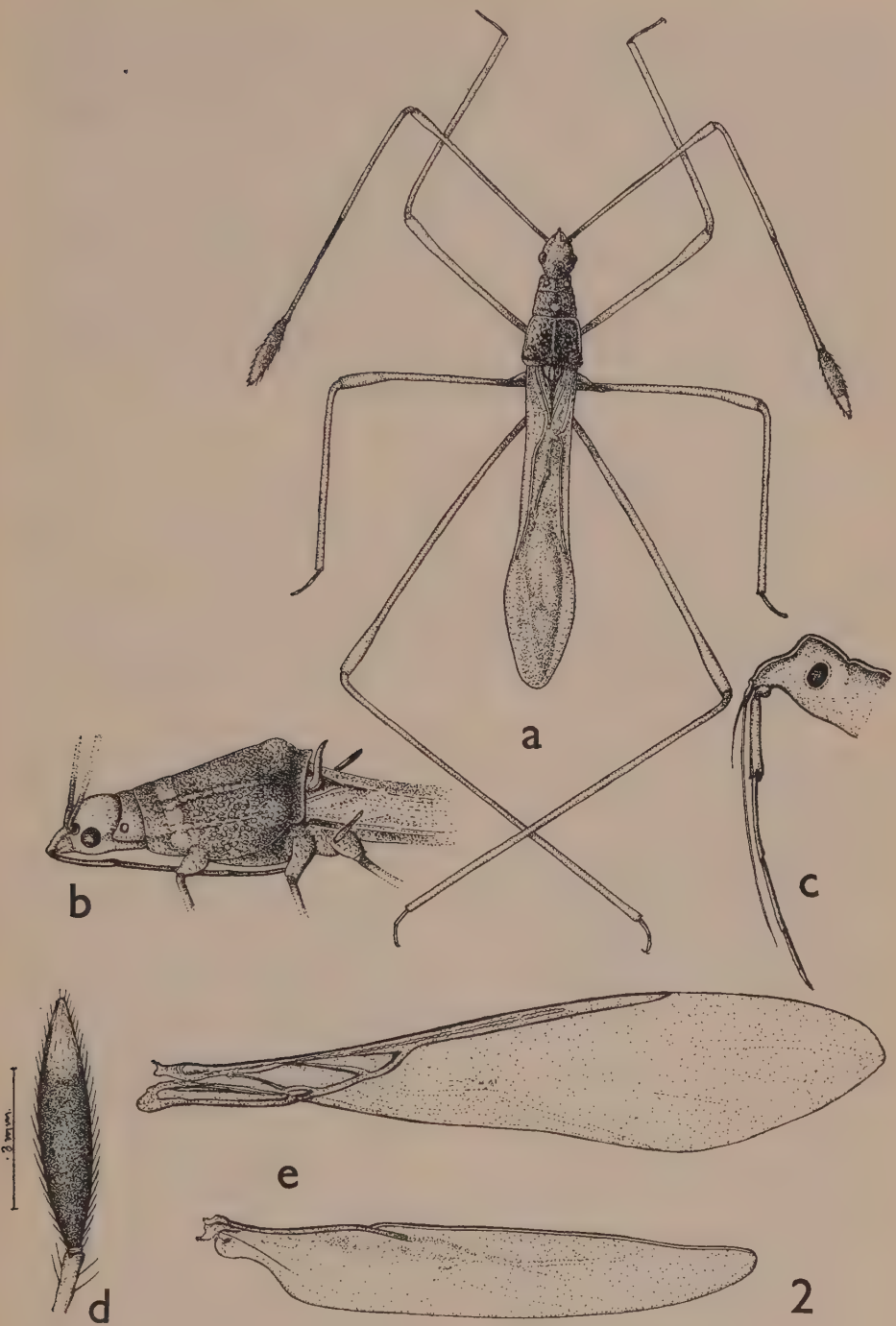

Fig. 2.—*Gampsocoris delhiensis* sp. n. Detail as for figure 1.

Pronotum (fig. 2*b*) longer than broad, densely punctate with large umbilicate punctures ; with a transverse sulcus at about one-third from the anterior end and thence rising slightly obliquely to about one-fifth from the hind margin, and then more or less abruptly falling obliquely ; a distinct median longitudinal carina present along the entire length ; a slight smooth swelling on either side of the longitudinal carina just in front of the transverse sulcus and three such swellings forming a transverse row along the highest part of the pronotum, the median one lying on the carina itself. Scutellum longer than broad, with a median spinous process which is slightly curved posteriorly. Meso- and meta-sterna with a distinct impression for receiving the rostrum in repose. Ostiolar processes long and slender, their apical one-third curved posteriorly. Legs long and slender, hind femora reaching beyond abdomen. Hemielytra (fig. 2*e*) long and narrow, somewhat acute at tip ; corium with three distinct basal cells. Hind wings (fig. 2*e*) with a single distinct vein running along the costal margin for some distance and turning inwards to meet a very indistinct vein at about one-third of the wing length from its base and then fading into the membrane ; remaining venation quite indistinguishable in slide mount ; anal margin shallowly emarginate near base of wing. Abdomen long and slender, apex bluntly acute.

Holotype ♀, card-mounted, bearing label " on bottlegourd, Delhi, I.A.R.I., 25.vi.57, S. Ghai Collection."

Allotype ♂, slide-mounted, with same data, except date, 29.vi.57.

Paratypes, a series of 4 specimens (2 card-mounted, 2 in spirit), with same data, except dates.

Holotype, allotype and paratypes deposited in the National Pusa Collection, Indian Agricultural Research Institute, New Delhi.

A comparative study of this species and specimens of *Gampsocoris pulchellus* collected from the locality by the authors shows the following differences :

G. pulchellus (Dallas)	*G. delhiensis* sp. n.
Body : greenish testaceous, legs and antennae whitish, with numerous narrow blackish or brownish rings ; about 4 mm. (fig 1*a*).	more or less uniformly light ochraceous without any rings ; about 5 mm. (fig. 2*a*).
Antennal club : blackish with both base and apex white ; stouter, more than a fourth as thick as long, without a clearly demarcated short fourth segment at the base (fig. 1*d*).	black with only the apex white ; narrower, less than a fourth as thick as long, with a short, clearly demarcated basal fourth segment (fig. 2*d*).
Head : smooth and glabrous under both low and high powers of magnification.	smooth and glabrous under low powers of magnification, but when viewed under high powers appears distinctly tuberculate above.
Rostrum : not reaching the meta-coxae (fig. 1*b*).	reaching the meta-coxae (fig. 2*b*).
Prothorax : more solid, with the posterior part of the pronotum more steeply rising, and the posterior tubercles very prominent, especially the median one (fig. 1*b*).	somewhat slender, with the posterior part of the pronotum slightly rising, and the posterior tubercles not prominently elevated (fig. 2*b*).
Fore wing : relatively shorter and broader, having only a single clearly marked cell in the corium (fig. 1*e*).	relatively longer and narrower, with the corium having three distinct cells (fig. 2*e*).
Anal margin of hind wings : deeply emarginate (fig. 1*e*).	shallowly emarginate (fig. 2*e*).
Abdomen : greenish.	ochraceous.

Acknowledgment

The authors express their most sincere thanks to Dr. E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, for kind permission to carry out this work and for providing the necessary facilities in his Division.

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Book Notice

Guide to the Insects of Connecticut. Pt. VI. *The Diptera or true flies.* Fasc. 6. *March flies and Gall-midges. Bibionidae*, by D. Elmo Hardy ; *Itonididae* (*Cecidomyiidae*), by A. E. Pritchard and E. P. Felt (with revisions by C. L. and J. E. Remington). 8vo. Hartford, Conn., 1958. Pp. vi, 218 ; 15 pls. [*Bull. Conn. geol. nat. Hist. Surv.* 87.]

This latest volume in the Diptera series deals with two distantly related families of Nematocera.

The section on Bibionidae (pp. 5–46) is a revision of the portion on Connecticut of the author's well-known monograph of the North American Bibionids. It consists of an introduction, notes on oviposition, eggs, larvae, pupae, feeding habits and economic importance, with keys to genera and larvae and to the subfamilies Pleciinae and Bibioninae, and descriptions of species.

The introduction to the Itonididae has been taken from a manuscript prepared by the late Dr. E. P. Felt some years ago. The form of the keys has been modernised by C. L. and J. E. Remington, and A. E. Pritchard has written the section dealing with the subfamily Lestremiinae.

There are indices to Latin names of insects and plants, and each section is illustrated by plates.

UNDESCRIBED HEAD HAIRS IN LARVAE OF THE GENUS *CULEX* (DIPTERA : CULICIDAE)

By Donald H. Colless

(*Department of Parasitology, University of Malaya*)

During taxonomic studies of Malayan mosquito larvae, it has been found that, in certain species of *Culex*, the head possesses one or two pairs of very small setae which appear to be hitherto undescribed. These setae, for which I propose the term " post-orbital setae ", are placed laterally, a little anterior to the cervical collar, and figure 1 shows them as seen in *Culex rubithoracis* Leicester. Such setae appear to be a fairly constant feature of the subgenera *Lophoceraomyia* and *Culiciomyia*. All Malayan members so far examined in these two groups possess them, with the exception of three of the nepenthicolous species : *C. hewitti* Edwards, *C. navalis* Edwards and *C. coerulescens* Edwards. Strangely enough, they also occur in the apparently unrelated *C. hutchinsoni* Barraud and I have seen one specimen of *C. fatigans* Wiedemann with a single seta, on one side only. Variation in size, branching and number of setae, occurs both within and between species ; there may be one or two pairs, well developed or exceedingly minute, and with 1–3 branches. They provide therefore a minor taxonomic character for the identification of certain species. Of more interest, however, is the possibility that they indicate a degree of relationship between the subgenera and species which possess them, thereby providing confirmation of the usually assumed link between *Lophoceraomyia* and *Culiciomyia*. It also seems possible that these subgenera are linked to Edwards' group B of the subgenus *Culex*, through *C. hutchinsoni*, which is a rather aberrant member of the latter group.

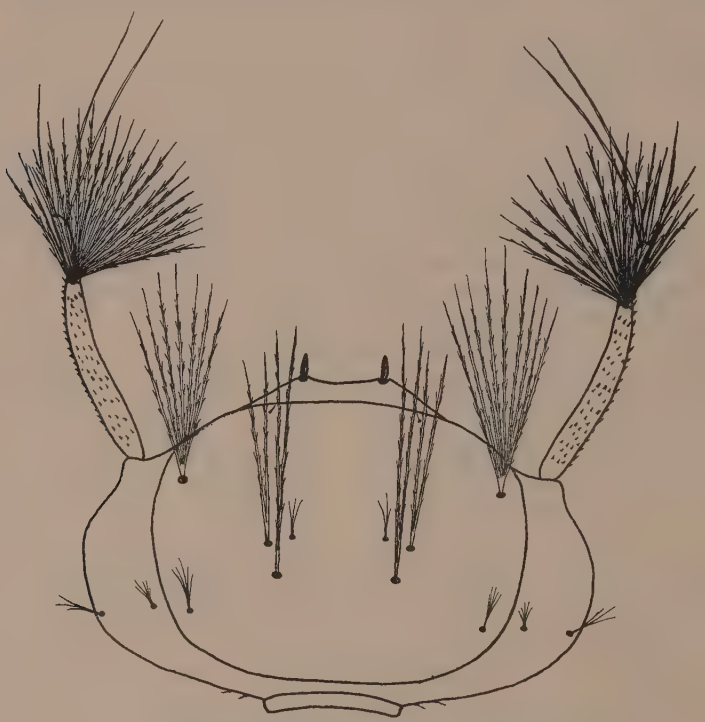


Fig. 1.—*Culex rubithoracis* Leicester. Post-orbital setae.

A NEW SPECIES OF HETEROGASTRINAE FROM NORTH-WEST AFRICA (HEMIPTERA : LYGAEIDAE)

By G. G. E. Scudder

(*Department of Zoology, University of British Columbia, Canada*)

In a small collection of Lygaeidae from Nigeria, made by Mr. J. L. Gregory, are representatives of a species of Heterogastrinae which is new to science. On external characters the species runs to *Hyginus* Stål in the key given in an earlier paper (Scudder, 1957).

Hyginus guinensis sp. n.

Male (fig. 1)

Covered throughout by a dense, fine decumbent pale pubescence.

Head black with clypeus testaceous ; width 1·93 mm.; coarsely punctate ; first antennal segment pale ferruginous, fuscous at extreme base and apex and ventrally ; second segment dark brown with extreme apex pale ; third segment dark brown with extreme base and apex pale ; fourth segment dark brown with base pale ; antennal ratios 1·13 : 2·56 : 1·72 : 1·68 ; rostrum apically fuscous and extending to posterior coxae.

Pronotum black with central streak on posterior half and near anterior margin, pronotum anteriorly and outer thirds of posterior half luteous ; elongate with a very weak carina on lateral margins ; coarsely punctate ; width 2·64 mm., length 2·11 mm.

Scutellum black with a luteous Y-shaped carina ; rather coarsely punctate especially apically.

Legs pale ferrugino-ochraceous ; apical fifth of tibiae and anterior face of fore tibiae black ; tarsi black with basal segment except extreme base and apex white ; fore femora armed ventrally with a short subapical spine.

Hemielytra dark brown-black with anterior margin, *Cu* and a subapical area slightly paler ; membrane fuscous.

Venter black with ostiolar peritreme, acetabular caps and extreme lateral margin of sterna and connexival segments luteous. Total length 9·7 mm.

The left antenna of the type specimen shows antennal oligomery, with measurements 1·13 : 2·94 : 2·31.

Female

Coloration as in male, but slightly paler ; spermatheca with a spherical apical bulb and a long duct, which has the distal part long and irregularly coiled and leading into a swollen sac-like portion, in turn leading into a short, loose spirally twisted part. Head width 1·93 mm.; antennal ratios 1·13 : 2·27 : ? : ? (missing) ; pronotum length 2·08 mm., pronotum width 2·73 mm.; total length 9·8 mm.

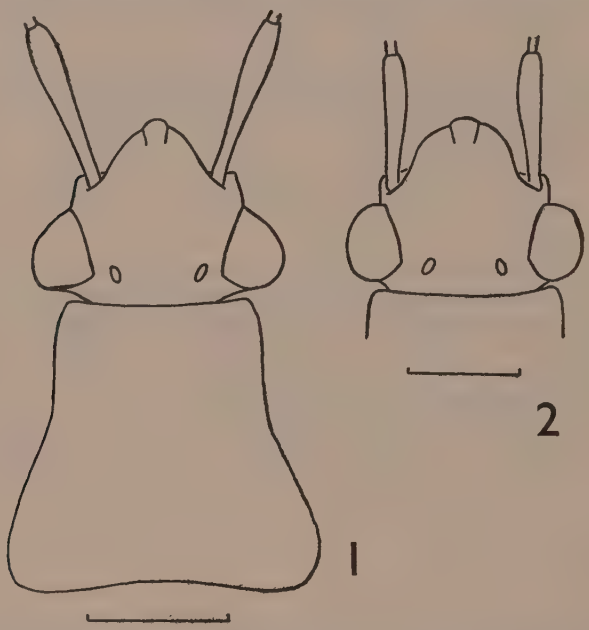
Type ♂, Nigeria : Ibadan, 2.iv.1957 (*J. L. Gregory*) ; in British Museum (Nat. Hist.).

Paratypes : 2 ♂, 1 ♀, data as type ; 1 ♂, Sierra Leone : Kenema, to light, i.iv.1946 (*J. Jordan*). In British Museum (Nat. Hist.) ; G. G. E. Scudder coll.

Hyginus guinensis is very similar to *H. africanus* Schouteden. It differs in the shape of the head and pronotum (figs. 1–2) and in the coloration of the

first antennal segment. In *H. africanus* the basal segment of the antenna is black whilst in *H. guinensis* there is a distinct ferruginous streak dorsally.

The spermatheca of *H. guinensis* and *H. africanus* is very similar to that of *Dinomachus grandis* Scudder (*see* Scudder, 1957). It is quite possible that the above mentioned African species of *Hyginus* may represent a new genus, but they are retained in the latter genus until the examination of more Oriental material enables the limits of *Hyginus* to be ascertained.



Figs. 1, 2.—(1) *Hyginus guinensis* Scud.; head and pronotum of male.
(2) *H. africanus* Schout.; head of female. Scale lines = 1 mm.

To agree with the present concept of the genus *Hyginus*, the last part of couplet 8 in my previous key should read

" Corium with fuscous markings not as above; tibiae usually without three fuscous annulations; spermatheca as in fig. 1 or 26
Hyginus Stål "

The separation of *Dinomachus* Distant from *Hyginus* by a simple and satisfactory key couplet is difficult and perhaps impossible. However, this does not mean that they are not good genera. If the genus is to mean more than just an artificial group of species, it is probable that in some cases it will be impossible to recognise it and express it in a simple key couplet (*see* Cain, 1956).

Acknowledgments

I wish to thank Dr. H. Schouteden for the loan of a paratype of *Hyginus africanus* Schout. and Dr. W. E. China and the Trustees of the British Museum (Nat. Hist.) for the loan of the Ibadan material.

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Beetles of the British Isles. By E. F. Linssen. 2 vols. 8vo. London (Warne), 1959. Pp. 300, 39 pls. ; Pp. 295, 87 pls., text illust. [*Wayside & Woodland Series*.] £3.

This is one of the latest publications in the *Wayside and Woodland* series.

Vol. 1 deals with the Superfamilies Caraboidea, Palpicornia, Staphylinoidea and Diversicornia. There is an introductory chapter of nearly 60 pages on structure, metamorphosis, distribution, social behaviour, nomenclature and classification, followed by the main body of the text which consists of keys and descriptions.

Vol. 2 covers the Clavicornia, Heteromera, Lamellicornia, Phytophaga and Rhynchophora, and includes the parasitic Strepsiptera.

Each volume contains a bibliography, a guide to the abbreviations of authors' names, a glossary of terms and an index.

The work is well illustrated with numerous text-figures and both black and white, and coloured plates. Many of the figures have been taken from the engraved plates to Fowler's *Coleoptera of the British Islands* and have been hand-coloured by Mr. A. F. Stuart.

Plecoptera. Par Jacques Aubert. 8vo. Lausanne (Société entomologique suisse), 1959. Pp. 140 ; 456 text-figs. [*Insecta Helvetica. Fauna* 1.] Fr. 11.25.

This is the first part of a new work on the Insects of Switzerland, which the Swiss Entomological Society is to issue in two parallel series.

The first, *Fauna*, will contain keys for identification, descriptions and illustrations, with brief notes on geographical distribution and biogeography. The other, *Catalogus*, will give detailed studies of geographical distribution, biogeography and ecology, and act as a complement to the keys. Each volume will be devoted to one Order, Family or Sub-family according to the importance of the group, and will be written in the language of the author.

In the present work there is an introductory chapter of 17 pages, with sections on literature, development, larval ecology, distribution, origin and evolution, and collecting and conservation, followed by keys to adults and larvae.

SENSITERGA INFUSCATA GEN. ET SP. N., A NEW ISOTOMID COLLEMBOLAN FROM BRITAIN

By D. H. Murphy

(*Department of Zoology, Durham Colleges in the University of Durham*)

In the course of work on the Collembolan fauna of the Nature Conservancy Reserve at Moor House, Westmorland (Conway, 1955), a very distinctive, undescribed species of Collembola was encountered in *Sphagnum* moss. This species, while falling into the Isotominae, is so isolated that the erection of a new genus for its reception has proved necessary.

Sensiterga gen. n.

Clothing of simple, entire setae with macrochaetae poorly differentiated; all tergites provided with a number of simple, thin-walled sensillae. Sense organ of Antenna III with numerous (up to 19) accessory sensillae in addition to the two sense clubs. Ant. I and II also bearing sensillae. Ocelli 8 + 8, unequal. Postantennal organ (PAO) simple, slightly constricted, 1·5 diameter of proximal ocellus in length. Furca long, reaching to ventral tube; manubrium with many ventral setae; dens 1·5 to 1·6 length of manubrium, tapering, dorsally crenulate and with many setae; mucro quadridentate. Abd. tergites V and VI ankylosed, but with slight indication of the suture.

Type species *S. infuscata* sp. n.

Generic affinities: *Sensiterga* is intermediate between *Isotoma* and *Isotomina* in many characters, but distinct from both in the large numbers of sensillae in the sense organ of Ant. III. From *Isotoma* it is separated by the fusion of the last two segments and the poor differentiation of macrochaetae; from *Isotomina* by the quadridentate mucro, numerous ventral setae of the manubrium and numerous setae of the corpus tenaculi in the adult. The introduction of this species into either genus would render them inseparable.

Sensiterga infuscata sp. n.

Diagnosis: see generic description.

Affinities: no close relationships among described forms.

Size (maximum).—1·4 mm.

Colour brownish yellow with black eye patches and small vertical spot.

Cuticle with very fine primary granulation.

Clothing of smooth, pointed setae, slightly variable in length but without clearly differentiated macrochaetae; some setae, however, although not longer than the others, tend to stand more erect on the living animal and may correspond to macrochaetae. Setae rather longer towards apex of Abd. V and VI. Each tergite provided with simple, blunt, thin-walled sensillae about half length of normal body setae (rarely one of these may be replaced by a microchaeta). Th. ii with 1 anterolateral and 4 + 4 in the posterior row of setae; Th. iii with 2 + 2 anterolateral and 4 + 4 posterior; Abd. I to Abd. IV with (5–) 6 + 6 posterior; Abd. V + VI with 2 + 2 near anterior edge, 1 : 1 slightly posterior to these and 5 + 5 in middle of segment (anterior to the almost obsolete division).

FIGS. 1–8.—*Sensiterga infuscata* sp. n. (1) Dens, lateral view (paratype), × 1; (2) antenna (holotype), × 2; (3) claw III (holotype), × 4; (4) claw I (holotype), × 4; (5) manubrium, ventro-lateral view, × 2; (6) postantennal organ and ocelli (lenses), × 2; (7) mucro, dorsal view (paratype), × 6; (8) mucro, inside view (paratype), × 6.
(All magnifications quoted are relative to the scale included in the illustration.)

Antennae 1·3 to 1·4 head diagonal, with segments I : II : III : IV as 20 : 28 : 27 : 41. Antennae (fig. 2) bearing sensillae on all segments. Ant. I with sense organ on inner side consisting of 4 long, slender sensillae and 3 short, stout sensillae; Ant. II with 4 slender sensillae among the distal setae; Ant. III with the usual 2 sense clubs freely exposed, plus up to 19 accessory sensillae of which 2 are in the usual position for lateral sense hairs in Isotomidae; Ant. IV with a non-retractile papilla on inner side terminating in 2 straight, pointed pins; on outer side a stout capitate pin in a shallow depression; numerous sense hairs in a tract on the outer side.

Ocelli 8 + 8 (? always) of which G and H are very strongly reduced. Of these, only the 6 large lenses have an associated cuticular cornea. PAO (fig. 6) elliptical, often slightly constricted, 1·5–1·6 diameter of proximal ocellus (lens) in length.

Length of head and body segments (mid-dorsal line of type) as 88 : 67 : 57 : 47 : 53 : 56 : 53 : 45. Slightly variable, thus Abd. III and Abd. IV subequal, but either may be slightly longer than the other. Abd. V and VI ankylosed but with a slight trace of suture.

Claw (figs. 3 and 4) with lateral teeth and usually with an inner tooth half-way along inner edge, especially on first and second legs; empodium 3-winged, untoothed, with strong inner lamellae and approximately two-thirds length of inner edge of claw; tibiotarsus without tenent hairs.

Tenaculum with 4 + 4 barbs on rami and up to 6 setae on the corpus, two of which are strong and situated one behind the other in the mid-line.

Furcula long, reaching to the ventral tube. Manubrium (fig. 5) longer than wide, with numerous dorsal and ventral setae. Distribution of ventral and lateral setae as shown in figure. Dens 1·5 to 1·6 length of manubrium, strongly setose dorsally throughout its length and crenulate except for the proximal third and a terminal portion equal to length of mucro. Ventrally with few proximal setae. Mucro (figs. 7 and 8) quadridentate with successively a curved, strong apical, a stronger, erect, triangular anteapical and a much smaller proximal tooth, all in the midline, and externally a long, blade-like lateral tooth on a level with the proximal. Anterior crest strongly compressed laterally, the anteapical tooth subtending a moderately wide inner lamella and a mucronal setae inserted on the outside at the base.

Juveniles are coloured a striking orange-yellow which becomes gradually infuscated with age. The body sensillae are not reduced in number, while the body setae are, so that the former are a very striking feature of the juvenile. On the antennae, the smallest individuals (? first instar) showed 9 accessory sensillae on seg. III, none on seg. II and 1 on seg. I. The corpus tenaculi has, in all but the very largest individuals, only the two anteromedian setae. Ventral setae of manubrium reduced although still " numerous "; dens relatively thickset; mucro shorter and more compressed than in adult.

Type Locality.—Cumberland: Moor House National Nature Reserve, near Alston, Westmorland, 5.v.54, surface of peat pools and in wet *Sphagnum* on Bog Hill (Grid Ref. 35/768328).

Holotype and paratypes in alcohol; further paratypes in fluid mounts, in British Museum (Nat. Hist.).

The species occurs throughout the reserve in *Sphagnum*, extending to over 2500 feet on Knock Fell. It has not been recorded from outside the immediate vicinity of this area.

Acknowledgments

The advice of Professor J. B. Cragg (Department of Zoology, Durham University) and the award of a research scholarship by the Nature Conservancy are gratefully acknowledged.

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TRIBES OF THE TENTHREDININAE AND A NEW EUROPEAN GENUS (HYMENOPTERA : TENTHREDINIDAE)

By Robert B. Benson

(*British Museum (Natural History)*)

Professor J. de Beaumont of the Musée Zoologique, Lausanne, has found a most remarkable new sawfly in Switzerland. He showed me the first specimen in 1957, a unique female; in 1958 he was successful in obtaining two more specimens, both males, and when I was with him in 1959 I collected one more male. These are specimens of a new species of a new genus that belongs near the base of the Tenthredinine stem in the Tenthredinidae.

Their discovery raises again the definitions of the subfamilies of the Tenthredinidae. Before seeing these specimens I had already decided that the Eriocampini would be better transferred from the Blennocampinae to the Tenthredininae, where for the present they could be fused with the Sioblini. The new genus, however, appears not to be in the same line as this group, though sharing with it a generalised form of anal cell in the fore wing. It appears to show more affinities with the tribe Tenthredopsini.

Further evidence is brought forward showing the close affinity of the Blennocampinae and the Tenthredininae, thus supporting Maxwell's thesis (1955) that these two should be fused into one subfamily.

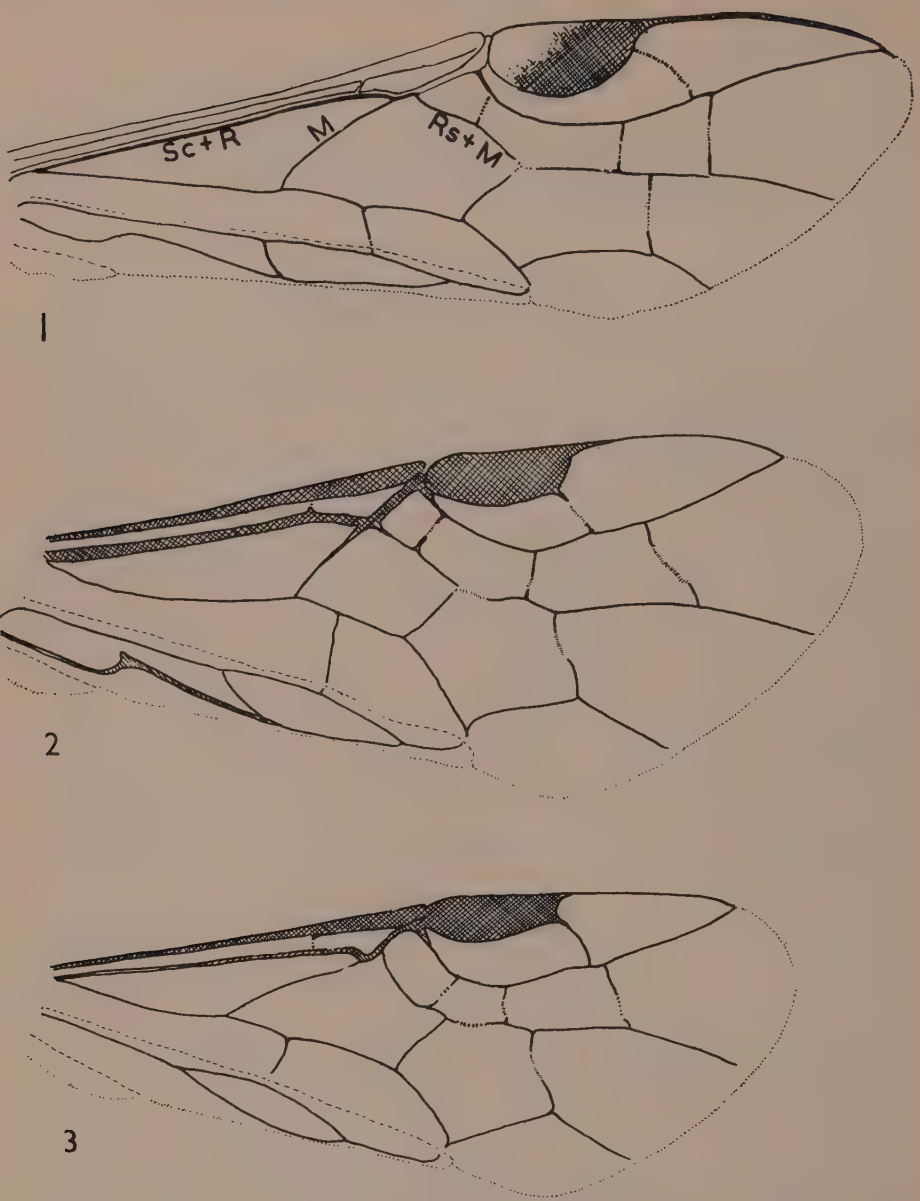
A new tribe is proposed for *Cacosyndia*, with its wingless females from Samarkand, and a note is added on two nearctic genera to be included henceforth in the Sciapterygini.

Eopsis gen. nov.

Head with blunt labrum reflexed apically. Clypeus medially excised in front to a depth of about half its total length. Mandibles bidentate. Antenna at least twice as long as breadth of head, with each of the 9 segments longer than broad. Antennal crests well developed. Eyes slightly higher than long (1·2 : 1·0), and almost twice as far apart in front as the height of one. Malar space one-third to two-thirds as long as distance between antennal sockets. Occipital carina absent.

Thorax with mesoscutellum acute in front and longer than broad. Legs normal; claws with long inner tooth almost as long as end tooth but with no basal lobe; hind tibia longer than femur; tibial spurs longer than apex of tibia. Wings similar to those of *Armitarsus* and *Pseudosiobla* (N.B. *M* of fore wing joins *Sc* + *R* at a distance from the origin of *R* + *M* about equal to the transverse part of *Sc*, and *Sc* + *R* angled at junction with *M*; *M* and *Im* + *cu* diverge slightly towards stigma; anal cell with a slightly oblique cross-vein beyond middle; female hind wings with enclosed cell *M* present but cell *RS* absent, and *cu-a* received on *AI* at almost a right angle) but differing in that the male is similar to the female, lacking the external venation characteristic of those genera, and also in that the stigma of fore wing is almost semicircular, being about twice as long as wide (in *Armitarsus* and *Pseudosiobla* the stigma is almost three times as long as wide). Abdomen normal with first tergite divided and exposing a small triangular blotch of unsclerotised tissue.

Type of the genus: *Eopsis beaumonti* sp. n.



Figs. 1–3.—Fore wing of : (1) *Eopsis* ; (2) *Eriocampa* ; (3) *Cacosyndia*.

Eopsis beaumonti sp. nov.

Female

Colour : black with the following parts white, or on legs brownish-white : palps, mandibles in the middle, labrum, clypeus, middle of supra-clypeal area, fleck on antennal crests, patch on inner orbits below and two patches above, long fleck on outer orbits, a dorsal fleck along hind margin of temples each side, and a tiny spot in middle of post-

ocellar area ; front and hind margin of pronotum, tegula, small spot in middle of each of anterior mesonotal lobes, anterior half of mesoscutellum and a small spot in front, middle of metanotum, longitudinal bar across middle of mesepisternum, outer side of coxae and trochanters, trochantelli, apical half of front femur and more or less of lower margin of middle and hind femur, front and middle tibiae (except for upper margins), more or less of outer and inner faces medially of hind tibia, and more or less of bases of front and middle tarsal segments, narrow medial hind-margin of all tergites, though laterally expanding to form a continuous white band on each side of abdomen, hind margin of sternites, basal plates and sawsheath (though this becomes brown apically).

Wings hyaline ; costa, subcosta (*i.e.* anterior half of *Sc* + *R*) and basal half of stigma yellowish-white ; rest of venation brown.

Head parallel-sided, temples in dorsal view as long behind as length of eye ; antenna about as long as *c* of fore wing ; malar space two-thirds distance between antennal sockets ; antennal crests continued back to joined raised lateral margins of frontal area, which is longitudinally grooved from front ocellus to interantennal area ; POL : OOL[1] as 1·0 : 1·8 ; hind ocelli closer together than from hind margin of head (1·0 : 1·7) ; postocellar area with deep straight lateral furrows.

Hind tarsus almost as long as tibia (1·0 : 1·1) ; basitarsus as long as two following tarsal segments together and half the third.

Ovipositor about as long as hind femur ; apex strongly compressed laterally so that it is needle-shaped in dorsal view and projects beyond apex of abdomen about twice as far as the cerci ; saw as in figure 8.

Micro-sculpture : whole insect shining with but small scattered punctures becoming denser on clypeus, face, orbits, front of anterior mesonotal lobe and scutellum behind ; abdomen without transverse alutaceous sculpture ; *pubescence* fine and sparse. *Length* 8·5 mm.

Male

Coloured as female but white flecks on head all much reduced ; anterior lobe of mesonotum entirely black and fleck on scutellum much reduced in size ; tergites white-margined apically above and expanded pale colour forms a lateral band to abdomen only on extreme ventro-lateral margin ; wings with stigma, costa, and all venation black.

Antenna as long as costa of fore wing and half stigma ; hind tarsus about as long as tibia, and basitarsus about as long as two following tarsal segments together. Genitalia as in figures 6 and 7. Length 6·5–9 mm.

SWITZERLAND : Vaud, Les Pleiades, *c.* 1200 m., 1 ♀ (holotype), 25.v.1955, 1 ♂, 24.v.1958, 1 ♂, 29.v.1958 (*J. de Beaumont*) and 1 ♂, 3.vi.1959 (*R. B. Benson*). Holotype and paratype in Zoological Museum, Lausanne ; two paratypes in British Museum (Nat. Hist.).

DISCUSSION

(a) *The Tenthredininae*

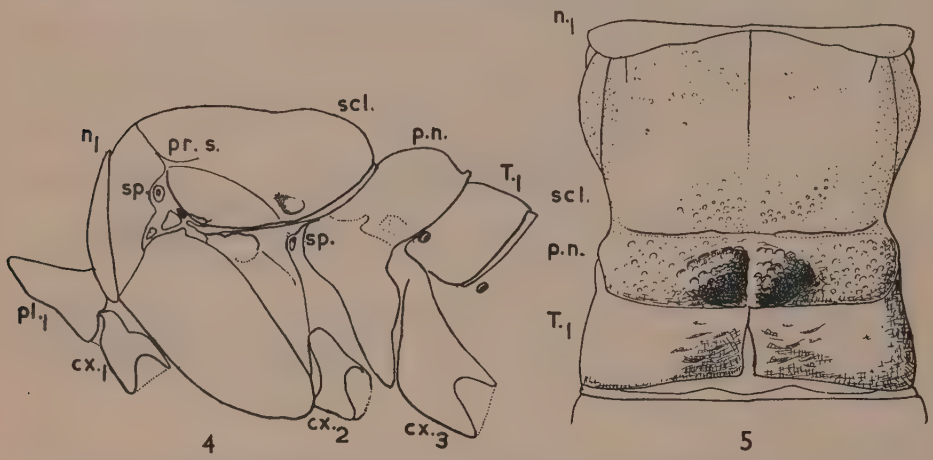
It is difficult to determine the nearest relatives of *Eopsis*. In general shape and colour pattern *E. beaumonti* might at a glance be mistaken for *Aglaostigma pinguis* Klug, but morphologically it differs in some rather important characters. For example, the distance between the point where *M* joins *Sc* + *R* in the fore wing and the origin of *Rs* + *M* is less than the transverse part of *Rs* ; in fact, only about half this length (fig. 1) ; by definition a Tenthredinine should have the distance between these two points greater than this length (*see* Benson,

[1] Postocellar line (distance between the inner edges of the two lateral ocelli) and ocular-ocellar line (distance from outer edge of a lateral ocellus to the compound eye.—[Ed].

1952, figs. 137 and 138). Takeuchi (1952) first drew attention to the fact that a good distinguishing character for the Tenthredininae is that $Sc + R$ of the fore wing curves down sharply to meet M. This feature is shown well in the new genus.

(b) *The Position of the Eriocampini*

This feature, however, is also evident in the Eriocampini (*Eriocampa*, *Eriocampopsis*, *Dimorphopteryx* and *Pseudosiobla* (fig. 2)) heretofore regarded as belonging to the Blennocampinae, though as an isolated tribe therein. They



Figs. 4 and 5.—Thorax of *Cacosyndia dimorpha* Freymouth: (4) in lateral view; (5) in dorsal view. *cx.*, coxa; *n.*, notum; *p.n.*, postnotum; *pl.*, pleura; *pr.s.*, prescutal suture; *scl.*, scutellum; *sp.*, spiracle; *T.*, tergite.

would appear, however, to be more naturally placed in the Tenthredininae, where their stout ornate thorax, including even the crater-like punctures on the mesepisternum, is strikingly similar to that in several Oriental genera, such as *Conaspidia*, that have always been regarded as belonging to the Tenthredininae. Probably the Eriocampini and Sioblini should form one tribe, as the venational differences between them are intergraded, as also are the large coxae of *Siobla* with the small ones of *Eriocampa*

(c) Eopsis *as a Generalised Member of the Tenthredopsini*

Eopsis, however, is not closely related to the Eriocampini (+Sioblini). The slim build and tendency to elongation in all its parts, its mesoscutellum, acute in front, and its obsolete occipital carina suggest an affinity to *Aglaostigma* in the Tenthredopsini.

We have to ask how a hypothetical generalised representative of the Tenthredininae could be distinguished from a generalised member of the Blennocampinae if the oblique cross-vein in the anal cell of the fore wing of the Tenthredininae was still retained and M had scarcely begun to fuse with $Sc + R$ so that it was received on $Sc + R$ close to the origin of $Rs + M$; and we would suggest that it might show the kink in $Sc + R$ where this is

joined with *M*. This is precisely what is seen in the Eriocampini and *Eopsis*; and *Eopsis* appears to represent the Tenthredopsini at just this stage of evolution.

(d) *Cacosyndiini trib. nov. for* Cacosyndia

When I was at Washington in 1956 I examined in the United States National Museum specimens of *Cacosyndia dimorpha* Freymouth, from Samarkand, with its wingless female; and I was able to acquire, by exchange, a damaged pair for the British Museum.

The male, on the strength of its wing-venation, would be assigned to the Blennocampinae were it not for the fact that here, too, *Sc* + *R* in the fore wing shows the same kink at its junction with *M* as is characteristic of the Tenthredininae (fig. 3). It differs from the Tenthredininae (*see* Benson, 1952, figs. 137 and 138) in that *M* joins *Sc* + *R* very close to the point where *Rs* arises and in its petiolate anal cell, unlike that of any known Tenthredinine. Incidentally it also shows slight Selandriine features, the recurving of *Rs* + *M* at its base and the convergence of *M* with *Im-cu*.

In other respects, however, *Cacosyndia*, with its very long simple claws and elongate pilose antenna, would appear to be Blennocampine rather than Tenthredinine and I herewith propose **Cacosyndiini trib. nov.** for its reception.

Cacosyndia dimorpha is, in the female, the only known wingless adult sawfly, though one or two northern Nematinae and *Dolerus* have brachypterous females (*see* Benson, 1958, fig. 501). Winglessness by itself may sometimes have very little taxonomic significance, but I have drawn the thorax of this wingless female in lateral and dorsal views (figs. 4 and 5), as this species is rare in collections and little known. The most striking, but not unexpected, feature is the obsolescence of the prescutal and scutellar sutures of the mesonotum, so that the prescutum, scutum and scutellum are entirely fused, the scutellum being only represented by a slight convexity; the postnotum is, however, clearly separated by a deep suture and the postscutellum is clearly convex, though with a medial depression; and naturally the cenchri, for locking the wings, are absent. In lateral view it can be seen that the pleural sclerites are scarcely modified.

(e) *External Venation in Males*

The close affinity of the Tenthredininae and Blennocampinae is further suggested by another venational feature. In certain sawfly genera occur species whose males have external venation in the hind wings, that is to say a continuous vein round the whole margin of the wing except for the anal lobe (*see* Benson, 1952, fig. 139). Sometimes, however, in the same genera (e.g. *Tenthredopsis*) may occur males in the same or other species with normal or more or less intermediate venation.

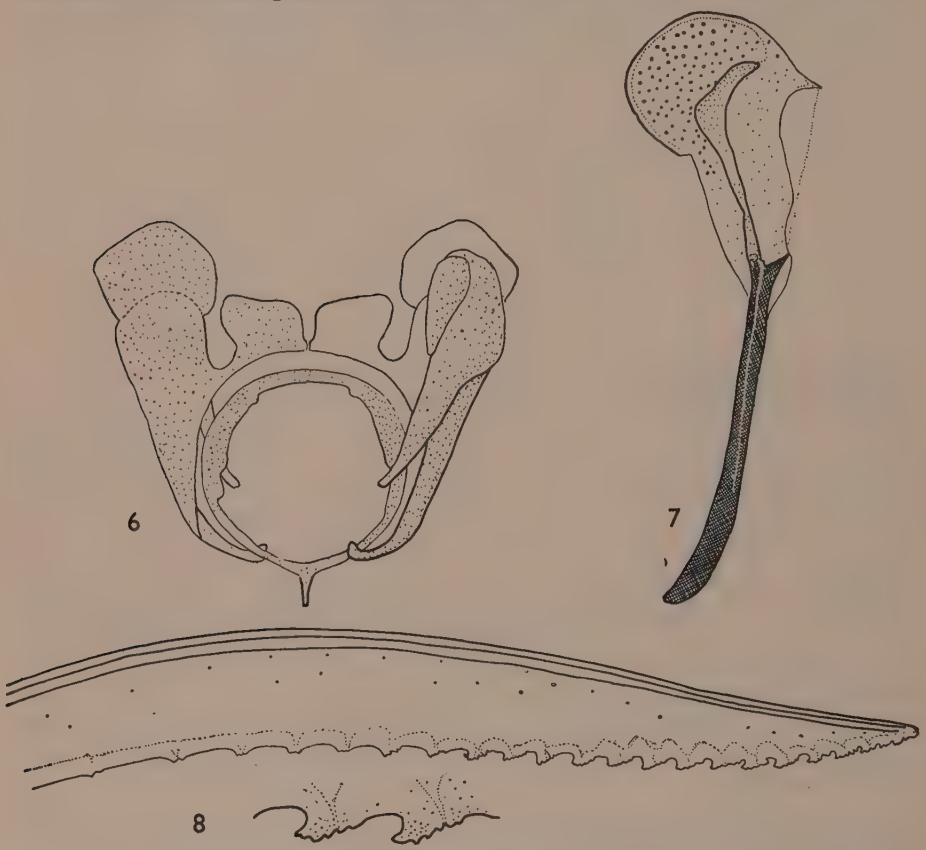
External venation occurs in the following genera represented in the British Museum (Nat. Hist.):—

Blennocampinae: *Parataxonus* (Empriini); *Canonias*, *Rhogographus*, and *Taxonus* (Allantini); *Antholcus*, *Cheilophleps*, *Hemibeleses*, *Periclista*, *Probleta*, *Synaptoneura*, *Trichiotaxonus* and *Waldheimia* (Blennocampini); *Caliroa* and *Neopoppia* (Caliroini).

Tenthredininae : *Armitarsus*, *Corymbas*, *Dimorphopteryx* and *Lagidina* (Eriocampini) ; *Aglaostigma*, *Perineura* and *Tenthredopsis* (Tenthredopsini).

Selandriinae : *Cleistoplax* (Strongylogastrini).

With only one exception (*Cleistoplax*), this venational feature is restricted to the Blennocampinae and Tenthredininae, and the genera are mostly primitive members of the less specialised tribes, including, for example, *Cheilophleps*,



Figs. 6–8.—*Eopsis beaumonti* sp. n. : (6) male genital capsule, left half in ventral view, right half in dorsal view ; (7) male penis valve ; (8) female saw.

one of the only two known endemic Australian Tenthredinidae, and five Blennocampinae and a Selandriine restricted to South America. The significance of this character is not known. It might be a relic of bygone purpose as it seems logical to suggest that in Hymenoptera relic characters might survive in males where the single set of chromosomes allows less scope for dominance. It is perhaps noteworthy that external venation is today characteristic of the hind wings of primitive Cicadoidea in Hemiptera and in both wings of Odonata ; and it is suggested in various Neuroptera where there is a tendency for the veins to bifurcate near the wing margin. May it not sometime have been characteristic of Blennocampine-Tenthredinine sawflies?

(f) *Maxwell's Thesis and Conclusions*

Maxwell (1955), in studying the alimentary tract and its associated glands in sawfly larvae, introduced into the discussion a much needed entirely new set of data. Among other things she showed that the Tenthredinid larvae she studied tended to form three different phylogenetic lines which she thought indicated three main subdivisions of the Tenthredinidae. These were to be (1) Selandriinae (including Dolerini, Athaliini and Lycaotini); (2) Tenthredininae (including Heterarthrinae and Blennocampinae); and (3) Nematinae.

In proposing this fusion she claimed to be supporting and merely advancing one stage further the fusions I had already proposed (Benson, 1952). I cannot at present agree about the Athaliini and Lycaotini being transferred from the Blennocampinae to the Selandriinae, where on adult external morphology they do not fit. Their malpighian tubule arrangement, though similar to that of the Selandriinae, could be interpreted as a generalised Tenthredinine pattern, no more generalised than that of *Allantus calceatus* which she retains as a generalised Tenthredinine (Allantini) (*cf.* Maxwell's figures 83–86 and 105 with 96).

As to the Blennocampinae and Tenthredininae, it will have become evident earlier in this discussion that I agree on their close affinity, and it seems to follow that they should in future be treated as one subfamily, the Tenthredininae (including the Blennocampinae and Heterarthrinae), but retaining the resulting included tribes still as separate tribes, though these will no doubt later require further modification when more is known.

Note on the Genera of the Sciapterygini (Tenthredininae)

In addition to the two Mediterranean and Palaearctic genera originally proposed as forming the tribe Sciapterygini (i.e., *Sciapteryx* Stephens and *Elinor* Benson (Benson, 1946)), the genera *Tyloceridia* Malaise (Oriental) and *Zaschizonyx* Ashmead (Nearctic) also belong here by the original definition. In *Zaschizonyx*, in addition to *Z. montana* Cresson, I include also the species previously known as *Macrophya pluricincta* Norton, which I maintain could well be included in the same genus, even though it differs in having a narrower medial excision to the first tergite, because it shares with *Zaschizonyx* the following differences from *Macrophya* and the Macrophyini in having (1) the hind tibia longer than the femur without its trochantellus, (2) the occipital carina obsolete on the upper margin of the head, and (3) the hind tibial spurs shorter than the middle spurs and expanded basally.

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A NEW SPECIES OF TRICHOGRAMMATID (HYMENOPTERA, CHALCIDOIDEA) PARASITIC IN MIRID EGGS (HEMIPTERA-HETEROPTERA)

By M. F. Claridge*

(*Hope Department of Entomology, University Museum, Oxford*)

As in most families of Chalcidoidea, the generic system existing in the Trichogrammatidae is completely chaotic. Novicki (1939), in one of a series of papers on the group, has stated that there are certainly too many genera in the family. Kryger (1918) gave a key to the European genera and species which is now completely outdated by multitudinous generic descriptions.

The species here under consideration is very distinct and I have been unable to find a description of it in the literature. Dr. W. D. Hincks has kindly examined some of my specimens and is also satisfied that it is undescribed. However, its generic placing is most uncertain. It appears to fit best the description of *Monorthochaeta* Blood and Kryger (1928), which originally included the single species, *M. nigra* Blood and Kryger. The genus was characterised particularly by the female having antennae with two anelli, and two funicle and three club segments, and the fore wings without specialised hair patterns. In its antennae the present species fits well (fig. 1), but, unlike the type species, it has the hairs of the fore wing more sparsely distributed and arranged in rather more distinct rows (fig. 2). The latter character would bring it nearer to *Ufens* Girault (1911). Novicki (1935) has described a further species of *Monorthochaeta*, *M. galatica*. This quite legitimately widened the concept of the genus to include forms with more specialized wing trichiation. Later (1939) he suggested that *Monorthochaeta* should probably be considered as a synonym of *Ufens* Glt., since the only important difference seemed to be the number of club segments in the male antenna. This seems reasonable since the above characters of trichiation, by themselves, can hardly be considered of generic value. However, typical species of *Ufens* (= ? *Neocentrobia* Blood and Kryger, 1928) have a distinctive shortened and widened fore wing so that I hesitate to confirm the suggested synonymy of *Monorthochaeta* under *Ufens*. *U. tenuinervis* Novicki (1939) is an exception in the more normal shape of the fore wings, and in this it closely approaches my new species, and the genus *Monorthochaeta*.

From the above short discussion it can be seen that without a complete knowledge of the species, generic redefinition and synonymy would be unwise. I shall thus describe the present species in the genus *Monorthochaeta*, but shall give no generic redescription. Characters of possible generic value are included in the specific description.

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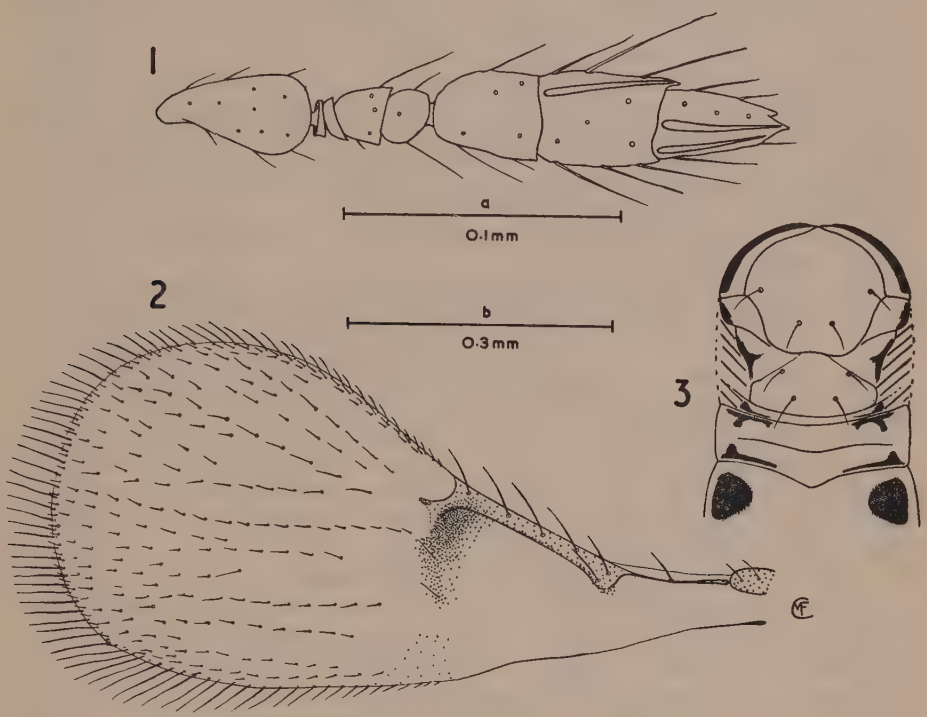
Monorthochaeta pulchella sp. n.

Predominantly yellow-testaceous, brightly coloured in life. Head yellow-testaceous; variable fuscous marking laterally below eyes and at lateral margins of clypeal area; eyes and ocelli bright red (may fade after death); antennal scape, pedicel and club predominantly fuscous; anelli, funicle, and scape and pedicel apically variably testaceous. Thorax and propodeum dorsally (fig. 3) bright yellow-testaceous; pronotum with distinct longitudinal dark fuscous line showing in dorsal view; lateral aspects variably fuscous marked, particularly at lateral and ventral margins of sclerites. Legs fuscous; coxae



FIGS. 1–3.—*Monorthochaeta pulchella* sp. n., female, from mounts in Canada Balsam: (1) Antenna in lateral view, scape omitted, to scale (*a*); (2) fore wing to scale (*b*); (3) dorsal view of thorax and propodeum to show colour pattern and setal arrangement only; semidiagrammatic.

apically, femora and tibiae basally and apically, testaceous. Fore wings (fig. 2) with distinct fuscous submarginal band extending below stigmal vein, fading on disc, but slightly developed on posterior margin; venation pale. Gaster predominantly yellow-testaceous; tergites laterally fuscous marked, particularly second and fifth to seventh, eighth almost entirely fuscous, except apically; ovipositor sheaths fuscous. Length about 1 mm.

Female.—Head rather wider than thorax and flattened dorsally (spirit specimens); fronto-vertex more than two-thirds width of head; POL : OOL[1] almost as 1 : 1. In lateral view head produced forward dorsally; eyes small; malar space between two-thirds and three-quarters maximum height of eye. Antennae (fig. 1) inserted slightly above

[1] Postocellar line (distance between the inner edges of the two lateral ocelli) and ocular-ocellar line (distance from outer edge of a lateral ocellus to the compound eye.—[Ed.].

lower level of eyes; scape short, about four times as long as wide, hardly expanded medially; pedicel more than half as long as scape; two distinct transverse anelli, second rather variable and often closely associated with the first funicle; two funicle segments, variably transverse to quadrate; club very distinct, three segmented, distinctly longer than pedicel, anelli and funicle together; long rhinaria variably and sparsely developed on club segments, forming distinct ridges.

Thorax and propodeum (fig. 3, semidiagrammatic) rather less than three-quarters length of gaster, about one-and-a-half times as long as wide; pronotum distinctly emarginated anteriorly; mid lobe of mesonotum with four well developed setae at posterior and lateral margin; scutellum, like mesonotum, with four setae positioned as in figure 3; propodeum smooth and flat. Legs with fore tibiae short, only about two-thirds length of corresponding femora; mid and hind tibiae longer, distinctly longer than their femora; hind coxae large, about two-thirds length of hind femora. Fore wing (fig. 2) with marginal vein rather thickened and bearing six to seven long setae, long, distinctly longer than submarginal vein; stigmal vein very short; no definite post-marginal vein; marginal vein ending distinctly within basal half of wing; trichiation only developed on apical part of disc, tending to form into definite rows basally; marginal cilia well developed; two or three longer hairs or setae in area of submarginal band.

Gaster with tergites two to seven more or less sub-equal; eight shorter; ovipositor only very slightly exserted.

Male.—As female, but antennal club rather shorter, hardly as long as pedicel, anelli and funicle together. Apical abdominal sternite dark fuscous and divided apically.

M. pulchella seems to be quite distinct from the other described Palaearctic species in colour pattern alone. As stated above, *Ufens tenuinervis* Novicki is closely similar, but differs in its darker colour and more widespread fuscous marking, less extensive submarginal band, extremely transverse anelli and ovipositor exserted for one-sixth to one-seventh of its length. There is little doubt that the two species should be considered congeneric, but there is doubt about the correct name to use for them.

Biology.—I have bred a series of *M. pulchella* from a number of egg batches of *Capsus* (= *Rhopalotomus* Auctt.) *ater* (L.) (det. T. R. E. Southwood). These were found under the leaf sheaths of *Deschampsia caespitosa* (L.) Beauv. in the autumn of 1957, whilst a number of the dead stems were being opened. The eggs were kept in small gelatin capsules at about external temperatures and adult *M. pulchella* of both sexes emerged the following summer together with an undetermined species of Scelionid (Proctotrupoidea). The *Capsus* eggs were obtained from a number of localities in the South Midlands, but *M. pulchella* from only one (*see below*). The latter is a marshy habitat where *Deschampsia* grows abundantly, forming thick tussocks in the drier areas.

Though the known species of *Trichogramma* Westwood are parasitic in exposed eggs of almost any insect species, it cannot be assumed that other species of the family also are. The known host eggs of *M. pulchella* are hidden beneath a leaf sheath so that the searching behaviour of the adult females must be rather more specialised.

Material studied.—England: Oxfordshire, Otmoor, National Grid Reference SP 5514–5614: 24 ♀♀, 13 ♂♂, emerged 12.vi.1958 (1 ♀ Holotype).

The female holotype is mounted on a slide in Canada Balsam together with a dissected female paratype. The slide, with two male paratypes, has been deposited in the Hope Department of Entomology, University Museum, Oxford. The remaining paratypes are in my personal collection.

Acknowledgments

This work has been carried out whilst in receipt of a research grant from the Department of Scientific and Industrial Research.

I should like to thank Dr. W. D. Hincks, University Museum, Manchester, for examining some of my material and giving his opinion on it. I also wish to thank Dr. T. R. E. Southwood, Imperial College Field Station, near Ascot, Berks., who very kindly undertook to examine the host eggs and was able to give a definite specific determination. My thanks are also due to Dr. M. W. R. de V. Graham, Dr. B. M. Hobby and Prof. G. C. Varley for reading the manuscript.

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A NEW SPECIES OF *DIESTOGYNA* KARSCH (LEPIDOPTERA: NYMPHALIDAE) FROM NIGERIA

By T. G. Howarth

(*British Museum (Natural History)*)

Some years ago the author's attention was drawn by Dr. P. Roche to a male of an undescribed species of the genus *Diestogyna* Karsch. It had such a distinctive coloration and shape that it would have been impossible to confuse it with any of the known species of this genus, but it was decided to leave it undescribed until more material became available. Since then the native collectors of Dr. Roche and Lt.-Col. T. H. E. Jackson have captured more of this species, and through the kindness of the latter more specimens have been presented to the Department of Entomology of the British Museum (Natural History) and these, supplemented by a series of both sexes from the Rothschild collection, make up the type series of this species which is now described.

Diestogyna pavo sp. n.

The colours with initial capitals mentioned in this description are those in Ridgway (1912) *Color Standards and Color Nomenclature.*

Male.—In general appearance *pavo* seems nearest to *grosesmithi* Aurivillius and *abasa* Hewitson but may be separated from them in the male by its well defined patch of iridescent blue on the disc of the fore wing upperside which does not extend into the cell, and by its shape in that it has the apex of the fore wing more attenuate than is normal in this genus.

Upperside fore wing: ground colour a deep Fuscous with the reniform cellular marking and that immediately beyond the end of the cell ringed with darker colour; white spot at base of interspace 6 so characteristic of *grosesmithi* reduced in *pavo* to a pale smear extending to vein 4; subapical area with four small prominent white spots arranged in a crescent in interspaces 4, 5, 6 and 8, that in interspace 6 being slightly larger than the others; in discal area a large well defined Dusky Slate-Blue patch which turns to a brilliant iridescent deep blue when viewed obliquely, extending from subbase along median vein to midway along vein 4 then curving posteriorly and parallel with outer margin in submarginal area to inner margin; a submarginal row of rather ill-defined dark brown spots situated interneurally and running from costa to hind margin; fringes white slightly darkened with brown interneurally; length from base to apex 26 mm.

Upperside hind wing: ground colour as fore wing shading to Sayal Brown towards apex; a series of darker brown interneural rather triangulate spots in post discal areas of interspaces 3–6; a series of interneural dark brown chevrons situated submarginally from post discal band and with their points towards the termen, distinct at hind margin and fading towards apex; in basal area of interspace 2 and extending into adjacent interspaces is a patch of the same blue as the fore wing; fringes as in fore wing with outer margin very slightly crenulate.

Underside fore wing: ground colour Burnt Sienna fading to Cinnamon Buff in interspace 3 to inner margin, overlaid with Pallid Quaker Drab from base to apex along costa including cell; either side of upper half of discocellular mark white; a whitish smear at mid costa as on upperside but broader; a series of white submarginal spots as on upperside

but 5 in number, minutely marked with dark brown outwardly; a series of submarginal chevrons fading towards apex and tornus, slightly darker than ground colour and inwardly marked with Pallid Quaker Drab and Cinnamon Buff; fringes as on upperside.

Underside hind wing: ground colour as underside fore wing overlaid with Pallid Quaker Drab at tornus and hindmargin; discocellular spot slightly darker than ground colour marked inwardly with Pallid Quaker Drab; a curved bar of this same colour towards the base of interspace 7 immediately above the discocellular spot; discal band irregularly pointed along veins, outwardly marked with Pallid Quaker Drab in interspaces 1b and 1c, an irregular shaped blotch of dark brown at base of interspaces 4 and 5; the curved post discal band consisting of a series of faint spots only slightly darker than ground colour from costa to hind margin with a series of 6 minute interneural deep brown points in interspaces 2–7, each with a small white or Pallid Quaker Drab point inwardly; this band outwardly marked with the latter colour between the faint spots and submarginal series of chevrons which fade towards apex; fringes as on upperside. *Antennae, head, thorax,* and *abdomen* a deep Fuscous, paler beneath.

Female.—Very similar to *grosesmithi* and *abasa* but with the pale transverse band of the upperside fore wing not broadening at termen as in *grosesmithi.*

Upperside fore wing: ground colour Buffy Brown basally and discally with the discocellular marks as in male, ringed with darker brown; a broad transverse band of a cream or Pale Ochraceous–Buff from mid costa to submargin of interspace 2, rather similar in shape to *abasa* but with veins more prominent; beyond transverse band to apex Olive Brown with 4 white subapical spots as in male; fringes Olive Brown with white sections interneurally and at apex, the latter not extending on to wing itself as in *grosesmithi*; length from base to apex 31 mm.

Upperside hind wing: ground colour as in fore wing with indistinct and irregular Olive Brown discal line with discocellular bar ringed with the latter colour; distally from discal line a series of Olive Brown interneural blotches, more prominent towards costa; a series of post discal triangular interneural spots of the same colour in interspaces 2–6, surrounded with Clay Colour, the post discal markings becoming indistinct in interspaces 1c and at apex; submarginal series of chevrons as in male; fringes as in fore wing.

Underside fore wing: like the male but generally paler and with transverse band as upperside but white instead of cream; fringes as in upperside.

Underside hind wing: as in male but generally paler.

Antennae, head, thorax and *abdomen* Buffy Brown, paler beneath.

Variation.—The males vary very slightly on the uppersides and undersides in the extent of the pale markings and the number of subapical white spots, two specimens having five instead of four. The females vary in the same manner in having the paler markings more extensive in some examples.

Holotype ♂, NIGERIA: Warri, x.1897 (*Dr. Roth*); Rothschild Bequest, B.M. 1939—1.

Allotype ♀, same data.

Paratypes, 5 ♂♂, same locality, taken 1896, vi.1896, vi.1897, x.1897, 3 ♀♀ taken vi, viii and x.1897; Rothschild Bequest, B.M. 1931—1. 4 ♂♂, 2 ♀♀, NIGERIA: Ikom, Ogoja Prov., i.1956 (*T. H. E. Jackson*); B.M. 1958—29.

Acknowledgments

The author wishes to express his gratitude to Lt.-Col. T. H. E. Jackson for defraying the cost of the accompanying plate and to Mr. N. D. Riley, C.B.E., and Mr. W. H. T. Tams of the British Museum (Natural History) for their help and suggestions.

PLATE I.

Diestogyna pavo sp. n.

Fig. 1.—Holotype male, Warri, Nigeria, upperside.
Fig. 2.—The same, underside.
Fig. 3.—Allotype female, Warri, Nigeria, upperside.
Fig. 4.—The same, underside.
Fig. 5.—Paratype male, Ikom, Nigeria, upperside.
Fig. 6.—The same, underside.
Fig. 7.—Paratype female, Ikom, Nigeria, upperside.
Fig. 8.—The same, underside.

Diestogyna pavo sp.n.

T. G. Howarth.

Adlard & Son, Ltd., Dorking.

MOSQUITOES OF NEW GUINEA (DIPTERA : CULICIDAE)

Part II*.—Notes on *Tripteroides* Giles, 1904

By W. Peters

(*Malariologist, Department of Public Health, Territory of Papua and New Guinea*)

While excellent descriptions of the larvae and adults of many species of New Guinea *Tripteroides* have been published, there are very few accounts of their pupae. This, the second in a series of papers on New Guinea mosquitoes, includes the descriptions of two new species and undescribed stages, mainly pupae, of eight known species. The pupae of three mainland species were described by Penn (1949), the *T. caledonica* complex and new Solomon Island species by Belkin (1950, 1955) and several new species from Netherlands New Guinea by Bonne-Wepster (1948). The subgeneric classification adopted here is that of Belkin, some of whose abbreviations have also been employed (1952, 1953*a*, *b*). In addition, the following abbreviations have been used in descriptions of pupal chaetotaxy :

> m, minute ; vs, very short ; s, short ; ml, moderately long ; l, long ; vl, very long.

These abbreviations follow those for the number and type of branches, *e.g.* 5–III–VI(2, 3b–vl) means that hair 5 on segments III–VI have 2 or 3 branches from near the base and that these are very long ; replacement of 'b' by 'f' indicates that the branching is at or near the middle of the hair instead of near the base, and by 'd' that the branching is secondarily dichotomous or irregularly dendritic.

Tripteroides (*Tripteroides*) *alboscutellata* Lee

Lee, 1946, *Proc. Linn. Soc. N.S.W.* **70** : 235.

Pupa (fig. 1).—*General appearance :* integument light brown, hairs dark brown, trumpets dark brown at the base, lighter at the tip. *Cephalothorax :* 1(2b–l), 2–5, 7(1, 2b–ml), 6(1–s), 8, 9(2, 3b–l), 10(1, 2b–s), 11(1–l), 12(1–ml). Trumpets short and broad. *Abdomen :* 0–I–VII(1–m) ; 1–I(large dendritic), II–VII(1–s) (on I–III may be 2b) ; 2–I–VII (1–vs, anteromedial to 1 on II–VII) ; 3–I(1–ml), II, III(1–ml, more posterior), IV(2, 3b–s, posterolateral to 5), V–VII (1, 2b–ml) ; 4–I(1–s), II(1f–s), III, IV(1–s), V(2, 3b–s), VI(2b–s), VII(1–s) ; 5–I(1, 2b–s), II(1, 2f–s), III(1, 2b–s), IV, V(1–vl), VI(1–l), VII, VIII(1–s) ; 6–I, II(1–ml), III–VI(1–s), VII(2b–s) ; 7–I–V(1–m, spinose), VI(1–s, stronger), VII(12b–l, plumose), VIII(17b–l, plumose) ; 8–12 posterior, 8–II, III(1–s), IV–VI(2, 3f–s), VII(1–s) ; 10–I(1, 2b–s), II–IV(1–s), V, VI(2f–ml), VII(1–ml) ; 11–II–VI(1–s), VII(1, 2b–s) ; 12–III–VI(1–ml), VII(1, 2b–ml) (medial to 11 on VI) ; 14–II–VIII(1–m). *Paddles :* edges smooth, granular at tip.

Described from link-bred[1] material from tree holes, Territory of Papua and New Guinea : Maprik, agreeing with paratypes. In collection of C.S.I.R.O., Canberra.

* For Part 1 of this paper see 1958, *Proc. R. ent. Soc. Lond.* (B) **27** : 89–92.

[1] *i.e.* Individual imagines associated with the skins of the fourth instar larvae and pupae.—[*Ed.*]

Tripteroides (*Tripteroides*) *quasiornata* (Taylor)

Taylor, 1915, *Proc. Linn. Soc. N.S.W.* **40** : 177.

Larva.—There appears to be some variation in this species, since larvae agreeing with Lee's description (1946) in the Maprik area produce dark adults which are very difficult to distinguish from *T. bimaculipes* (Theo.). Specimens from Mapamoiwa (D'Entrecastaux Islands) agree in all stages with Hill's pale specimens from Malanda (?) seen in the School of Tropical Medicine, Sydney.

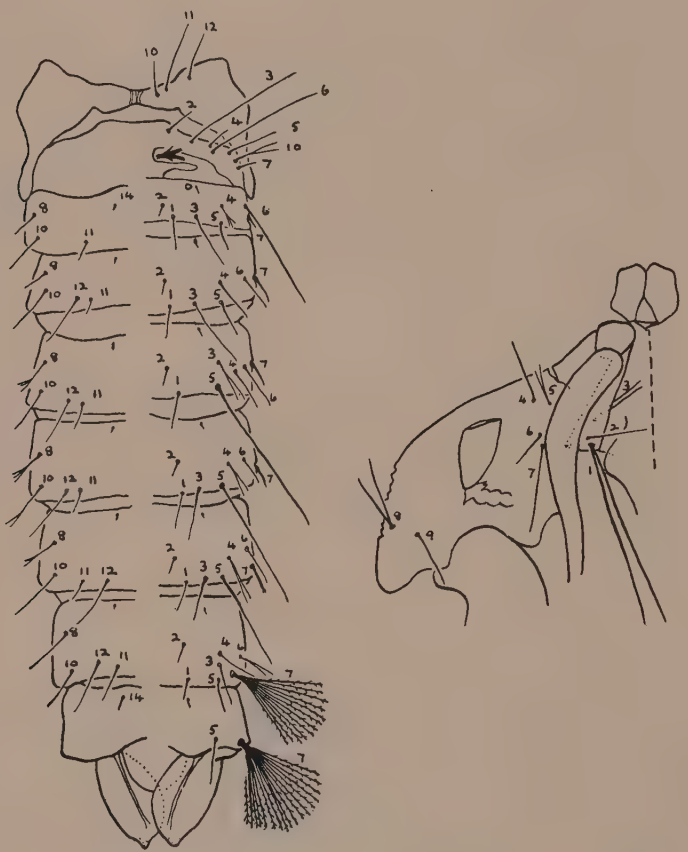

FIG. 1.—*Tripteroides* (*Tripteroides*) *alboscutellata* Lee : pupa.

Pupa (fig. 2).—*General appearance :* very similar to that of *T. bimaculipes* ; integument light brown, hairs not strongly contrasted, trumpets very dark, rather elongated but less so than in *T. bimaculipes*. *Cephalothorax :* 1(2b–l), 2–5, 7(1, 2b–ml), 6(1–s), 8(1–ml), 9(2b–ml), 10(2f–s), 11(1–ml), 12(2f–ml). *Abdomen :* 0–II–VIII(1–m) ; 1–I(large, dendritic), II, III, V, VII(1–s), IV(2b–s) ; 2–II–III(1–vs, medial to l), IV(2b–vs), V–VII(1–vs) ; 3–I–III(1–ml), IV(3f–s, antero-lateral to 5), V–VIII(1–s) ; 4–I(1–s), II, III(2b–s), IV, V(3f–s), VI(2f–s), VII(1–s) ; 5–I(3f–s), II, III(1–s), IV, V(1–l), VI(1–ml), VII(1–s), VIII (1–s) ; 6–I, II(1–ml), III–VI(1–s), VII(5b–s) ; 7–I–VI(1–vs), VII(11b–l, plumose), VIII

(19b–l, plumose) ; 8–III–V(1–s), VI, VII(1–ml), (VI may be 3f) ; 10–I–V (1, 2b–ml, may be 3f on IV) ; 11–II–VII(1–vs) ; 12–III, V–VII(1–ml), IV(2f–ml) ; 14–II–VIII(1–m). *Paddles :* edges smooth, tips concave.

Described from link-bred material, from tree holes, T.P.N.G. : Mapamoiwa, Fergusson Island, D'Entrecastaux Islands.

Fig. 2.—*Tripteroides* (*Tripteroides*) *quasiornata* (Taylor) : pupa.

Tripteroides (*Rachisoura*) *bisquamata* Lee

Lee, 1946, *Proc. Linn. Soc. N.S.W.* **70** : 252.

The pupa of this species is very easily recognised by the unusual stellate development of hair 2 on most of the abdominal segments. This species breeds in a variety of small containers and those reared from *Nepenthes* spp. differ from those from other sites, such as bamboo stumps, in that the serrate markings on the adult abdomen are poorly defined in the former. It seems that this character is linked with the degree of development of the stellate hairs 2 and it is hoped to make a biometric study of these characters at some future

date. The holotype and allotype, although apparently obtained from *Nepenthes* material, show well-marked abdominal serrations. The specimens on which this description is based agree closely in all stages with the type series in the C.S.I.R.O. collection, Canberra.

Pupa (fig. 3).—*General appearance :* light brown integument, I–III and antero-medially on IV–VI darker, cephalothorax dark dorsally, trumpets dark red-brown, stellate abdominal

Fig. 3.—*Tripteroides* (*Rachisoura*) *bisquamata* Lee : pupa.

hairs 2 very distinct. *Cephalothorax :* 1(1–vl, thick), 2, 3(6b–ml), 4(4b–ml), 5(5b–ml), 6(3b–ml), 7(3b–l), 8(1–ml), 9(5f–ml), 10(8b–s), 11(2b-ml), 12(1–ml). *Abdomen :* 0–II–VII(1–m); 1–I(large, dendritic), II(13, 14b-s), III–V(9b–s), VI(7b–s), VII(1–s) ; 2–I(3b–s), II(5f–s), III–VII(stellate hairs, III–V or VI(5–8b–ml), 1 or 2–4b on VII, lateral and well anterior to 1 on II–VII) ; 3–I(1–ml), II, III(1–l), IV(2b–s, lateral to 5), V(5b–s), VI(4b–s), VII(2b–s) ; 4–I(2b–vs), II(6f–s), III(2b–s), IV(9b–s), VI, VII(4b–s) ; 5–I(9b–s), II, III(4b–s), IV, V(1–vl), VI, VII(2b–l) ; 6–I, II(1–vl), III, IV(3b–s), V, VI(2b–s), VII(4b–s) ; 7–I, II(1–vs), III–V(1–s, spinose), VI(2b–s), VII(11b–l, plumose), VIII (17b–l, plumose) ; 8–III–VI(2, 3, 6 6b respectively) ; 10–I(3b–l), III–V(2, 3, 6b–ml), VI, VII(2, 1b–ml) ; 11–II(2b–s), III–VII(1d–s) ; 12–III(1–s), IV(3f–ml), V(2f–ml), VI(3f–ml, medial to 11), VII(3b–ml) ; 14–II–VIII(1–vs). *Paddles :* well marked fringe at sides, longer at tips.

Described from link-bred material, from *Nepenthes* spp. and bamboo stumps, T.P.N.G. : Maprik.

Tripteroides (*Rachisoura*) *filipes* (Walker)

Walker, 1861, *Proc. Linn. Soc. Lond.* 5 : 229.

Pupa (fig. 4).—*General appearance :* light reddish brown integument, darker dorsally on I–VI. *Cephalothorax :* 1(1–vl, thick), 2, 3(1–ml), 4(2b–s), 5(1–s), 6(1–s), 7(2b–ml)

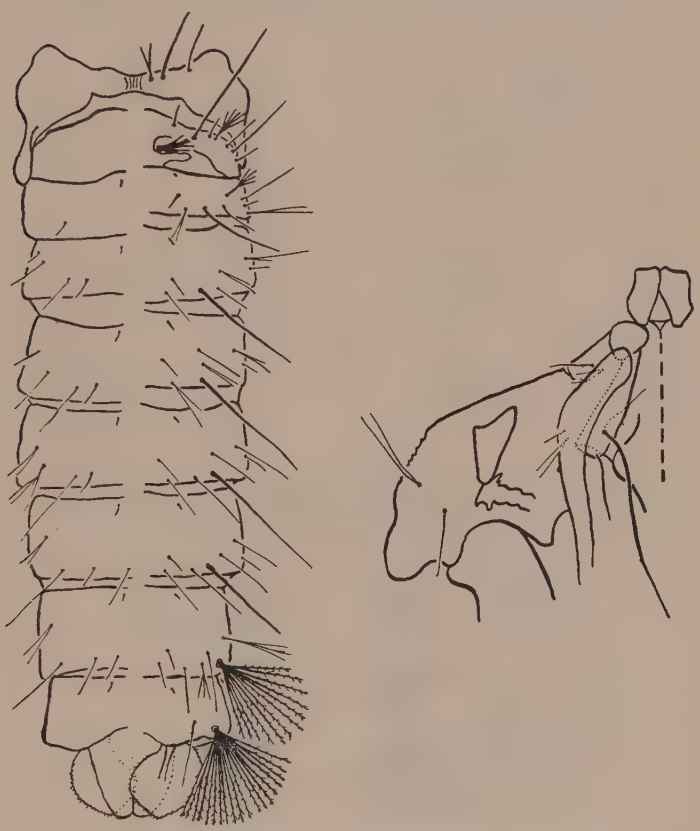

FIG. 4.—*Tripteroides* (*Rachisoura*) *filipes* (Walker) : pupa.

8(2b–ml), 9(1–ml), 10(2f–s), 11(1–ml), 12(1–s). *Abdomen :* 0–II–VIII(1–m) ; 1–I(large, dendritic), II(2b–s), III(1–s), IV(2b–s), V–VII(1–s) ; 2–I–VII(1–vs, medial to 1 on II, IV, V) ; 3–I–III(1–l), IV–VII(1–s; lateral to 5 on IV) ; 4–I(1–vs), II(2f–s), III, IV(2b–s), V–VII(1–s) ; 5–I(4f–s), II, III(1–s), IV–VI(1–vl, thick), VII(3f–s), VIII(1–ml) ; 6–I(1–s), II–IV(2f–ml), V, VI(1–ml), VII(3f–ml) ; 7–I–VI(1–vs), VII(12b–l, plumose), VIII(19b–l, plumose) ; 8–III(l–vs), IV(1–s), V, VII(2b–ml) ; 10–I(1–ml), II(1–s, lateral), III, IV(1–ml, ventral), V(4b–ml), VI, VII(1–ml) ; 11–II–VII(1–vs) ; 12–III, IV(1-s), V(1–ml), VI, VII(1–s, medial to 11 on VI) ; 14–II–VIII(1–m). *Paddles :* very small, minutely serrated on edges.

Described from link-bred specimens from *Nepenthes* spp., T.P.N.G. : Minj, Maprik and Sogeri. (These specimens agree with morphotypic specimens in the collection of the School of Tropical Medicine, Sydney.)

Tripteroides (*Rachisoura*) *brevirhynchus* Brug, 1934

Brug, 1934, *Bull. ent. Res.* **25** : 503.

Pupa (fig. 5).—*General appearance :* very similar to that of *T. plumigera* ; integument and trumpets very pale with strongly contrasting black hairs. *Cephalothorax* : 1(2f–vl),

Fig. 5.—*Tripteroides* (*Rachisoura*) *brevirhynchus* Brug : pupa.

2, 3(1–ml), 4(4b–ml), 5(2b–ml), 6(1–vl, thick), 7(1–s), 8(3f–ml), 9(1–ml), 10(6f–s), 11(1–ml), 12(1–s). *Abdomen :* 0–II–VIII(1–m; 1–I(large, dendritic), II–IV(2b–s), V(1–s), VI(3f–s), VII (1–s) ; 2–I–VII(1–vs, slightly spinose) ; 3–I(2f–ml), II, III(1–ml, strong), IV–VII(1–s, constant in position) ; 4–I(1–vs), II(3b–s), III, IV(1–s), V(2b–s), VI(1–s), VII(1–vs) ; 5–I(2b–s), II, III(1–l, strong, smaller than 3), IV–VI(1–l), VII, VIII(1–s) ; 6–I(1–ml), II–IV(1–vs), V, VI(1–s), VII(5b–s) ; 7–I(1–vs), II(1–ml), III, IV(1–l, strong), V(1–l, plumose), VI(4b–l, plumose), VII(8b–l, plumose), VIII(17b–l, plumose) ; 8–III–V(2b–s), VI(3b–ml), VII(4b–ml) ; 10–I(2f–ml), II(1–s), III–V(2b–s), VI, VII(1–ml) ; 11–III–VII (1–vs, spinose) ; 12–III–VII(1–s, medial to 11 on VI) ; 14–II–VIII(1–m). *Paddles :* exceptionally small, edges serrate with alternate long and short spicules.

Described from link-bred specimens from *Nepenthes* spp., T.P.N.G. : Minj, agreeing with examples of this species in the C.S.I.R.O. collection, Canberra.

Tripteroides (Rachisoura) leei sp. n.

This species, which is named in honour of Mr. D. J. Lee of the School of Public Health and Tropical Medicine, Sydney, keys out in Lee's adult key (1946) with *T. longipalpata*. It may be separated from this species, as indicated in the key (*vide infra*), by differences in the proportions of palps and proboscis and the size of the upper fork cell. The larva has a dark siphon

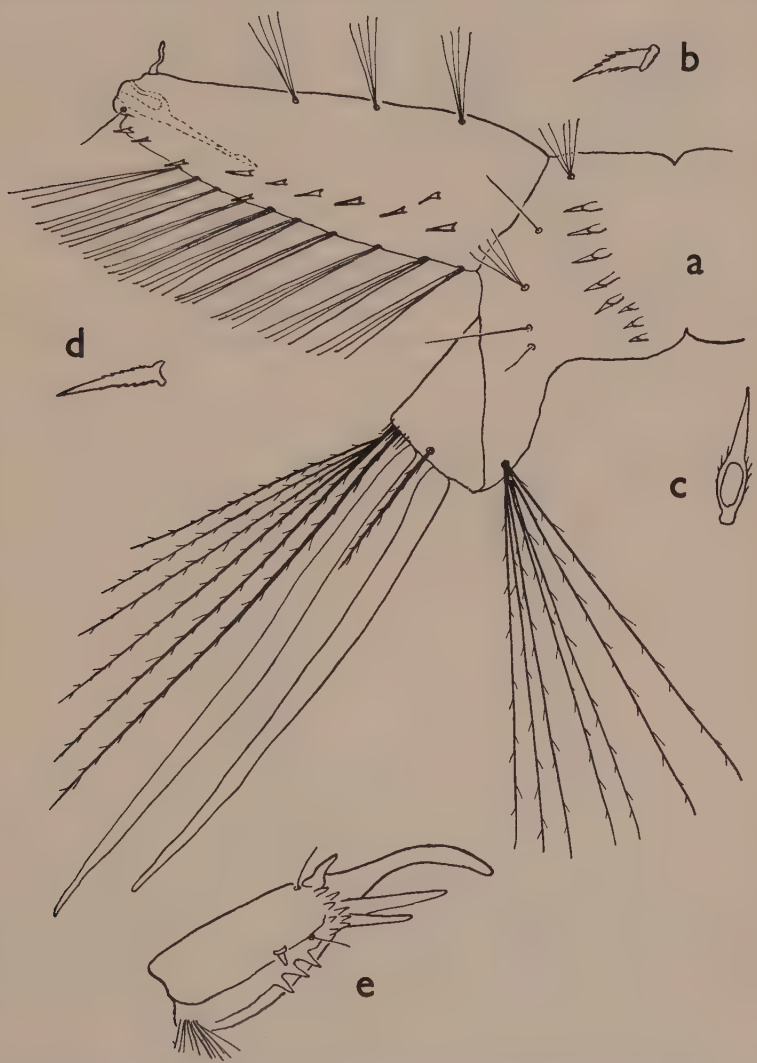

Fig. 6.—*Tripteroides* (*Rachisoura*) *leei* sp. n. Larva : (*a*) anal segments ; (*b*) pecten spines ; (*c*) comb spine ; (*d*) saddle spines ; (*e*) maxilla.

with a pecten in a double row and the ventral siphonal valve hair is single. Its movements are remarkably like those of *Armigeres* spp. The pupa may be distinguished as indicated in the key.

T. leei belongs to the *filipes* group of *Rachisoura*. Larvae have been found in tree holes and in the axils of a *Curcuma* sp., in the latter site together with those of *T.* (*Mimeteomyia*) *standfasti* sp. n.

Larva (fig. 6*a*, *b*, *c*, *d*).—*General appearance :* dark siphon and saddle of anal segment contrasting strongly with a pale body and head ; movements, especially when burrowing downwards, very suggestive of *Armigeres* spp. *Head :* smooth, oblong-shaped with a small double hair at 3/5 ; head hairs 4–8 single, 9 smaller and forked at the tip ; maxillae enlarged with a main tooth as long as the body of the maxilla, 3 secondary teeth and a number of very small teeth at the base of the main tooth ; 3 small teeth medially on the maxilla, as illustrated (fig. 6*e*). *Thorax :* no thoracic spines, pale 3–4-branched stellate hairs. *Abdomen :* comb on VIII of 8 separate pale spines with a few fine denticles at the base ; 3 ventral spines smaller than the more dorsal ones ; hair 1 with 5 slender branches, 2, 4 and 5 single, 3 with 4 or 5 slender branches ; siphon dark brown, index about 2·0, 3 pairs of 4-branched subdorsal tufts, 11 subventral tufts with 3 or 4 branches, slightly longer than the basal diameter of the siphon, a row of 7 fringed pecten spines laterally (the second from the base displaced dorsally) on the basal two-thirds of the siphon ; a second row of 3 or 4 spines from beyond halfway to the tip of the siphon lying more ventrally, hair 8 single or double ; saddle dark brown, triangular in side view, the distal edge with a few spines near the origins of hairs 2 and 3 ; hair 1 about as long as the saddle, stout and plumose, 2 with 5 branches, 3 about 4 times as long as the saddle, ventral tuft (hair 4) as long as 3 with 7 strong plumose branches ; anal gills very long and tapered to a point.

Pupa (fig. 7*a*).—*General appearance :* dorsal and ventral surfaces of II–VIII covered with minute spicules especially towards the midline ; setae, trumpets and general integument a reddish-brown with no conspicuous colour contrasts. *Cephalothorax* : 1(1–vl, stout), 2, 3, 5, 7 (1–s), 6(1–ml), 8, 9(1–ml), 10(5, 6f–ml), 11(5, 7f–ml), 12(1–l). *Abdomen :* 0–II–VIII(1–m) ; 1–I(large, dendritic), II(5b–s), III(2b–s), IV–VII(1, 2b–s); 2–I–VII(1–s) (posterior to 1 on II–VII) ; 3–I(1, 2b–ml), II, III(1–l, stout), IV(1–ml, slender, lying between 4 and 5), V–VII(1–s) ; 4–I(2b–s), II, III(1–s), IV–VI(1–ml) ; 5–I(2b–s), II(1, 2b–vl), III–VI(1–vl, stout), VII, VIII(1–s) ; 6–I, II(1–ml), III–VII(1–s) ; 7–I–VI(1–m), VII(11b–l, plumose), VIII(20b–l, plumose) ; 8–III(1–vs), IV–VI(2, 3b–s), VII(1–s) ; 10–I(1–ml), II(1–vs), IV(1–s), V(3f–s), VI, VII(1–s) ; 11–II–VII(1–vs) ; 12–III–VII(1–s, medial to 11 on VI) ; 14–II–VIII(1–m). *Paddles :* delicately spiculate on distal edges and surface with a weak midrib.

Male.—Head : palpi 75 per cent. length of proboscis, latter equal in length to fore femur ; palpi, proboscis, clypeus and antennae dark brown, antennae about equal in length to the palps, proboscis thickened at the tip ; head scales flat and dark brown except for some pale scaling at the sides. *Thorax :* scutal scales a mixture of broad and narrow dark brown scales, 2 pairs of prescutellar hairs, scutellum with broad dark scales, postnotum light brown, bare ; pleural integument chestnut brown with pale creamy flat scales on all sclerites except on the lower anterior sternopleura which are bare ; postnotal scales blending to dark brown on the upper half, no postnotal hair on type but present on the paratypes, 4 dark spiracular bristles. *Wings :* dark brown scaled with broad scales on all wing veins, upper fork cell 1·75 × stem. Length 3·5 mm. *Legs :* coxae light brown with creamy scaling, rest uniformly dark brown, hind tibia 88 per cent. of mid-tibia. *Halteres :* pale scaled at base, dark knobs. *Abdomen :* tergites I–VII dark, VIII creamy scaled, sternites I–VII creamy unbanded, VIII with a creamy median stripe, cerci dark scaled, the junction of the dark and creamy areas markedly dentate ; terminalia, lobes of tergite IX (fig. 7*b*) moderately long with 7 leaflets on each lobe, the lateral ones longer than the medial.

Female.—General appearance similar to that of the male. Palpi one-fourth length of proboscis, which is slightly longer than fore femur. Well marked postnotal bristle present, 2 spiracular bristles, no prescutellars on the type but 2 on the paratypes. Abdominal tergites I–VIII dark, sternites I–VIII creamy scaled, junction dentate. Upper fork cell 2·25 × stem. Wing length 4·1 mm.

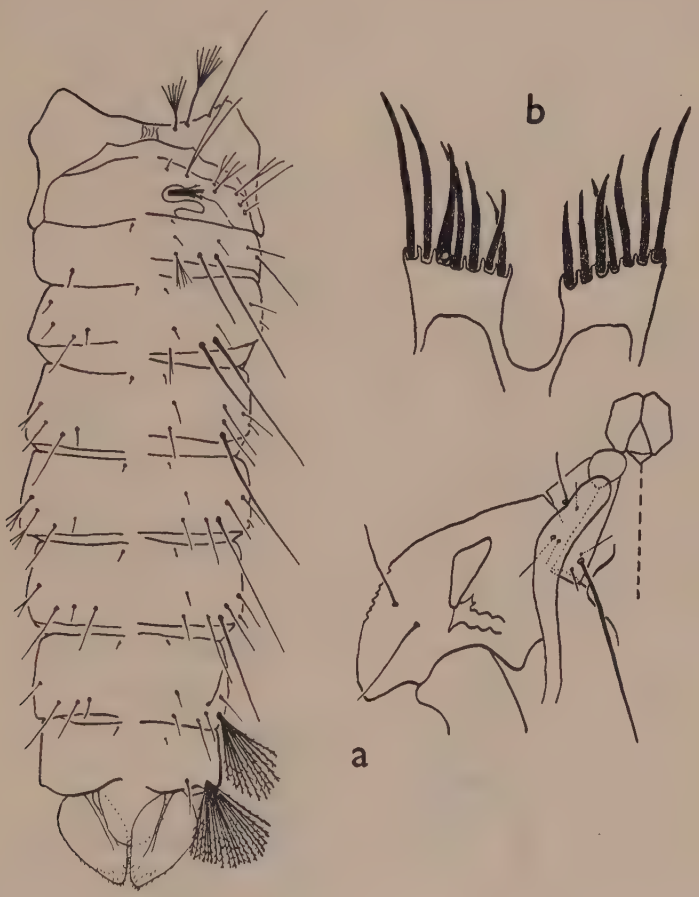

Fig. 7.—*Tripteroides* (*Rachisoura*) *leei* sp. n.: (*a*) pupa; (*b*) male terminalia.

Described from holotype male and allotype female with paedotype larval and pupal pelts; paratypes, 2 male, 5 female, 5 pupal pelts, and 1 whole larva. *Holotype* male, New Guinea: Maprik, Sepik District, Jan., 1958, No. 125 (from axils of *Curcuma* sp. (*Dr. W. Peters*); *allotype* female, same locality data, No. 74b; paedotype larval and pupal pelt in slide mount. *Paratypes*, same locality data, from tree holes and *Curcuma* sp. The holotype, allotype and some paratypes will be deposited in the collection of the Division of Entomology, C.S.I.R.O., Canberra. Other paratypes will be deposited in the British Museum (Nat. Hist.).

Tripteroides (Rachisoura) longipalpata Lee

Lee, 1946, *Proc. Linn. Soc. N.S.W.* **70** : 249.

Larva.—The two forms of maxillae found in the larvae are shown in figure 8 (*b*, *c*). The short toothed form is found in otherwise typical larvae which produce typical pupae and adults. It is quite distinct from the larvae of the previous species, in which the adults

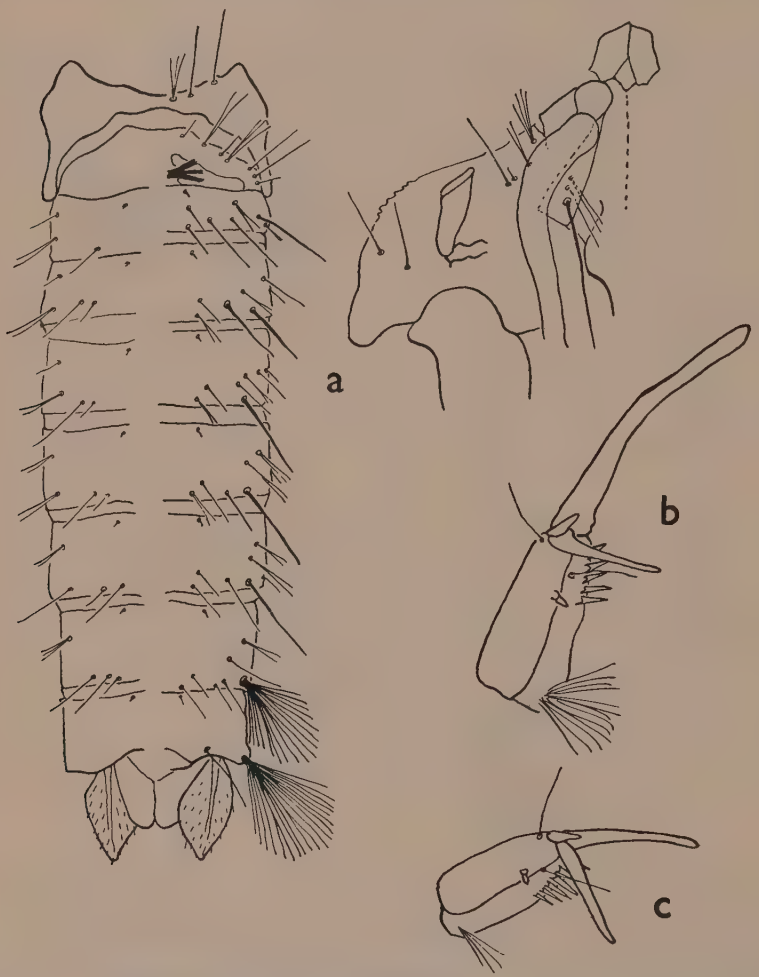

Fig. 8.—*Tripteroides (Rachisoura) longipalpata* Lee : (*a*) pupa. (*b*)–(*c*) Larva : (*b*) typical maxilla ; (*c*) short maxilla.

are very similar. In Lee's key to larvae (1946) the typical long toothed maxilla form is easily diagnosed but the short toothed form may be keyed out, since the spiculate tuft in front of the ventral brush of the anal segment is always present.

Pupa (fig. 8*a*).—*General appearance :* trumpets and integument light brown, setae distinctly darker. *Cephalothorax :* 1(1–vl, stout), 2, 8, 9(1–ml), 3, 5(2b–ml), 4(4b–ml), 6(1–vs), 7(1–ml), 10(3b-ml), 11, 12(1–ml). *Abdomen :* 0–II–VIII(1–m) ; 1–I(large, dendritic), II, VI, VII(1–s), III–V(2b–s) ; 2–I–IV, VI, VII(1–s), V(1–ml) ; 3–I(2b–ml), II(1–ml),

III(1, 2b-l, stout), IV–VII(1–ml, slender); 4–I(1–s), II–VI(2b–s), VII(1–s); 5–I(3b–ml), II(1–ml), III(1, 2b–l, stout), IV–VI(1–vl), VII, VIII(1–s); 6–I–IV(1-ml), V–VII(2b–ml); 7–I–VI(1–s), VII(17b–l, plumose), VIII(20b–l, plumose); 8–II–IV(1–s), V, VI(2b–s), VII(3b–s; 10–I(1–ml), II–V(2b–ml), VI, VII(1–ml); 11–II–VII(1–s); 12–III–VII(1–ml); 14–II–VIII(1–m). *Paddles :* very small, scantily and minutely spiculate, well separated medially.

Described from link-bred specimens from tree holes, T.P.N.G. : Maprik.

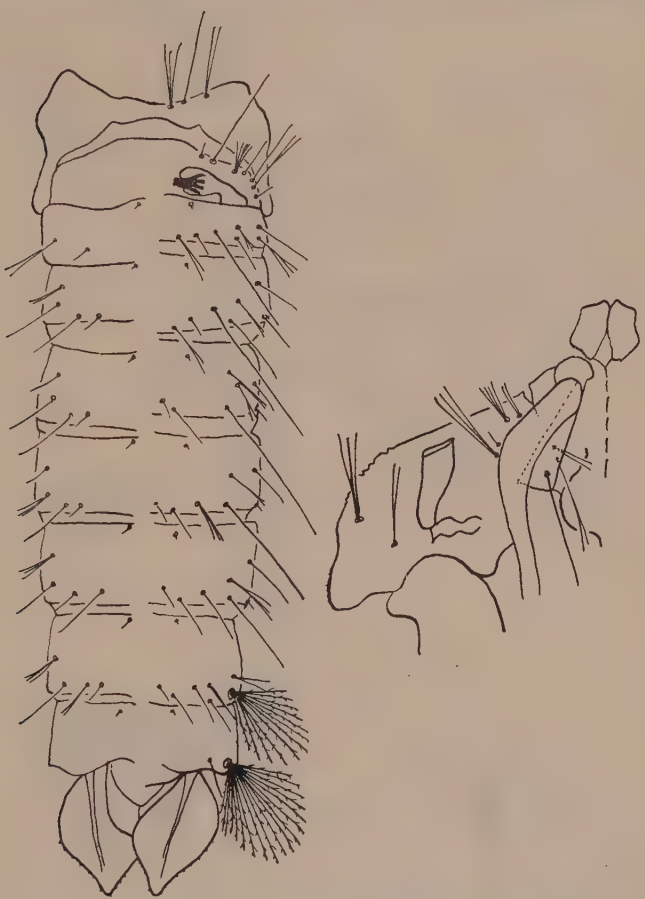

Fig. 9.—*Tripteroides* (*Rachisoura*) *fuscipleura* Lee : pupa.

Tripteroides (*Rachisoura*) *fuscipleura* Lee

Lee, 1946, *Proc. Linn. Soc. N.S.W.* **70** : 246.

Pupa (fig. 9).—*General appearance :* integument, trumpets and hairs very pale (as in the larva); dark brown medially on I–IV and slightly darker on V and VI. *Cephalothorax :* 1(1–l, stout), 2(2f–ml), 3, 4(2b–s), 5(4b–s), 6(1–vs), 7–9(1, 3b–ml), 10(3b–ml), 11(1–l), 12(2b–ml). *Abdomen :* 0–II–VIII(1–m); 1–I(large, dendritic), II, III(2b-ml), IV–VII (1–ml); 2–I–VII(1–vs); 3–I(1–ml), II, III(1–l, stout), IV(2b–s), V(3b–s), VI, VII(4, 5b–s); 4–I(5b–s), II–VI(2, 3b–s), VII(1–s); 5–I, II(1–s), III(1-ml), IV, V(1–l, stout),

VI(1–ml, stout), VII, VIII(1–s); 6–I–VI(1–ml), VII(2b–ml); 7–I, IV–VI(1–s), II(3b–ml), III(1–ml), VII(12b–l, plumose), VIII(22b–l, plumose); 8–III–VII(2, 3b–s); 10–I, II (2b–ml), III, IV, VI, VII(1–ml), V(3b–ml); 11–II–VII(1–vs); 12–III–VI(1–ml) (medial to 11 on VI), VII(2b–ml); 14–II–VIII(1–m). *Paddles :* Slightly spiculate at the edges, very pale.

Described from link-bred material from wild taros, T.P.N.G.: Maprik. Associated larvae and adults agree with the type series in the collection of the C.S.I.R.O., Canberra.

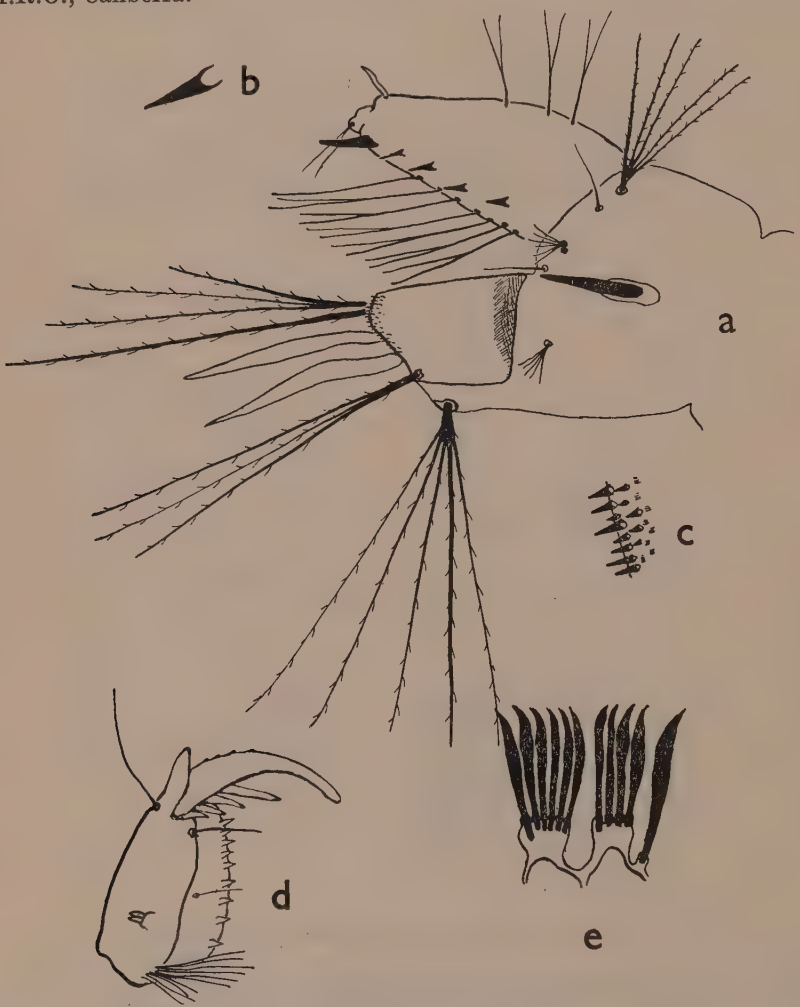

FIG. 10.—*Tripteroides* (*Rachisoura*) *plumigera* Bonne-Wepster: (*a*)–(*d*) larva: (*a*) anal segments; (*b*) proximal pecten spine; (*c*) distal edge of saddle; (*d*) maxilla. (*e*) Male terminalia.

Tripteroides (*Rachisoura*) *plumigera* Bonne-Wepster

Bonne-Wepster, 1948, *Treubia* **19** : 310.

The following descriptions are based on a series bred from tree climbing *Nepenthes* spp. The females agree in minute detail with the author's descrip-

tion, with the exceptions noted later, and the larva, pupa and male are quite distinct from any other described species. Associated species were *T. bisquamata* and *T. longipalpata*. The female is very similar to that of *T. bisquamata* but the male is separated by its short palps. The larva is easily recognised

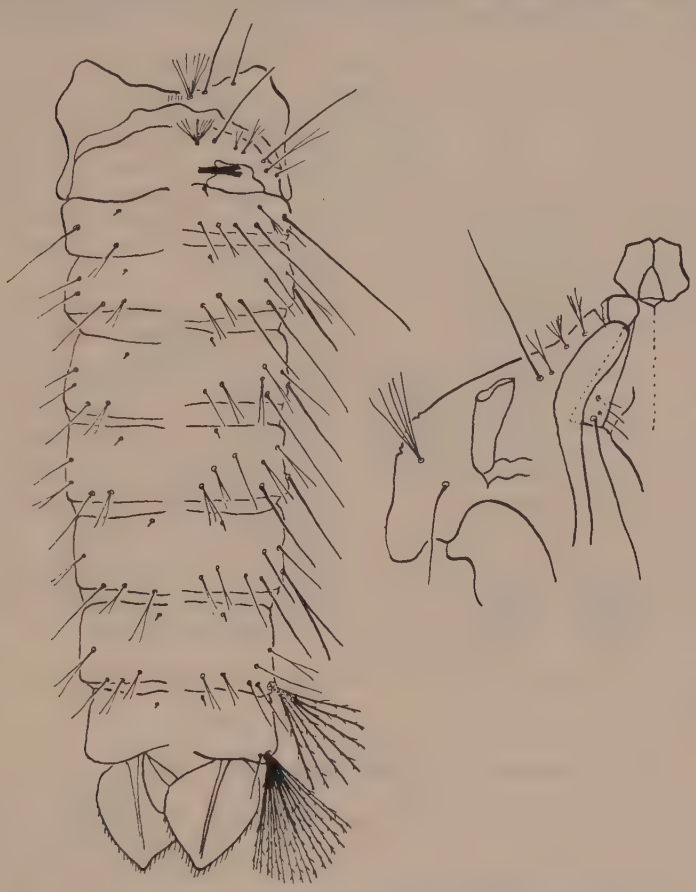

FIG. 11.—*Tripteroides* (*Rachisoura*) *plumigera* Bonne-Wepster : pupa.

by its very short siphon and single large comb spine. The pupa is recognisable by the unusual development of hair 7 on the abdominal segments III–VI.

Larva (fig. 10*a*, *b*, *c*, *d*).—*General appearance :* light brown head and short siphon, pale thorax and abdomen with dark brown stellate hairs, single dark comb spine. *Head :* antenna smooth, a single short hair at 4/5 ; head hair 4 with 2 branches, 6 with 3, 5 a single short hair, 7 long and single, 8 and 9 short and forked, 4 and 6 fairly long ; maxilla enlarged with one long, strongly curved tooth, serrate on the proximal outer margin, 5 smaller teeth and the usual appendages as illustrated in figure 10*d*. *Thorax :* sclerotised pro-, meso- and metathoracic plates with basal spines ; stellate hairs on thorax and abdomen few but with 6–8 very strong dark branches. *Abdomen :* segment VIII, comb with a single very large smooth edged spine ; hair 1 with 5 strong stellate branches, 2 single, 3 with 6 short branches, 4 single, 5 with 5 short branches : siphon conical with index about 1·5, 5–7 forked dorsal tufts, 6–8 forked ventral tufts, pecten of 4–5 simple spines on the

distal two-thirds, subapical spine much larger than the others, hair 8 with 2 branches; saddle incomplete, dark basally, spiculate distally, hair 1 with 3 long plumose branches, 2 with 3 long plumose branches, shorter than 3, ventral brush (hair 4) with 5 long plumose branches; anal gills one and a half times saddle length, slender and tapered.

Pupa (fig. 11).—*General appearance :* trumpets and setae much darker than the integument, darker patches antero-medially on II–VII; very similar to *T. brevirhynchus*. *Cephalothorax :* 1, 7(1–l, stout), 2(1–s), 3(2b–s), 4, 5(4b–s), 6(2b–s), 8(5b–ml), 9(1–ml), 10(7b–s), 11(1–ml), 12(1–s). *Abdomen :* 0–II–VIII(1–m); 1–I(large, dendritic), II, IV (1–s), III, VI, VII(2b–s), V(3b–s); 2–I(2, 3b–s), II–VII(2f–s); 3–I(1–ml), II, III(1–l) IV(2b–s, lying between 4 and 5), V–VIII(1–s); 4–I(2b–s), II(1d–s), III–VII(1, 2b–s); 5–I(3b–s), II–V(1–l, stout), VII, VIII(1–ml); 6–I(1-ml), II(1–l, stout), III–VII(1, 2b–s); 7–I, II(1–s), III–V(1–l, stout), VI(2b–l, plumose), VII(7b–l, plumose), VIII (18b–l, plumose); 8–III–V(1–s), VI, VII(2b–s); 10–I, II(1–ml), III, IV, VII(1–s), V(2f–s), VI(1–ml); 11–II–VII(2b–s); 12–III–V(1–ml), VI, VII(2b–ml) (medial to 11 on VI); 14–II–VIII (1–m). *Paddles :* with a well-marked fringe especially distally.

Male.—Agrees in general with Bonne-Wepster's description of the type female except in the following points : *Head :* palpi one-fourth length of proboscis, pale scales on the head in a mid-line from nape to between the orbital margins, where it expands to form a small triangular pale patch, fringe of pedicellar hairs not seen in male. *Thorax* : pale scales present on anterior scutal margin but none in front of the wing roots, 2–3 prescutellar hairs present, postpronotal bristle present or absent, 1–3 spiracular bristles. *Abdomen :* colour as in the female ; tergite IX (fig. 10*e*) with moderately deep lobes and 5 or 6 equal spines on each side (one specimen has the most lateral spine on one side on a separate pedicle but the spine reaches to the same level as the rest). *Wing :* length 3·2 mm.

Female.—The Maprik females agree very closely with Bonne-Wepster's description of specimens from Rattan Camp (1200 m.). Typical fine fringe of hairs present on the pedicels, 3 pairs of prescutellar hairs, 3–5 spiraculars and no pale scales in front of the wing roots. *Wing :* upper fork cell twice its stem, wing length 3·5 mm.

Described from a series link-bred from tree climbing *Nepenthes* sp., T.P.N.G. : Yambi, nr. Maprik.

Tripteroides (Mimeteomyia) standfasti sp. n.

This species is very similar to *T. argenteiventris*, with which it keys out in Lee's adult key. The latter has darker scutal scaling, a longer male palp and no dorsocentral bristles. The larva differs from *T. argenteiventris* in the paler siphon and details of the pecten spines and saddle spines. The pupae of the two species are similar but may be differentiated as indicated in the key (*vide infra*). *T. standfasti* belongs to the *caledonica* group of *Mimeteomyia* as defined by Lee. Larvae have been found in a variety of small containers, including axils of a *Curcuma* sp. and water in coconut shells. Associated larvae were *T. leei* (in *Curcuma* sp.), *Aëdes kochi*, *Uranotaenia nigerrima*, *U. diagonalis* and *U. argyrotarsis*.

Larva (fig. 12*a*, *b*, *c*, *d*).—*General appearance :* a small pale larva without enlarged maxillae, with slender stellate hairs each containing about 35 branches, lightly sclerotised head and anal segments. *Head :* round with scanty dorsal and abundant ventral hairs; antennae smooth, rather oblong with short forked hair at 5/6, terminal appendages very small; head hairs 4 with 3–4 branches, 6 with 4 branches, 5 with 5, 7 with 5–6, 8 with 4, 9 single. *Thorax :* no thoracic spines, all main dorsal ventral hairs with about 35 delicate branches. *Abdomen :* stellate hairs as on thorax, segment VIII with about 10 approximately equal, separate comb spines in a single row, spines smooth and sharp; hair 1 with

about 12 slender stellate branches, 2 and 4 single, 3 and 5 with 5 branches ; siphon index 2·5–3 with 3 pairs of 3-branched subdorsal setae and 6–8 longer 2-branched subventral setae, 3 or 4 pairs of 2–4-branched lateral setae ; 3 or 4 simple pecten spines on basal half of the siphon, edges smooth or slightly frayed, hair 8 single ; saddle with long single lateral hair, distal edge with long and short spines simply tapered or with a few

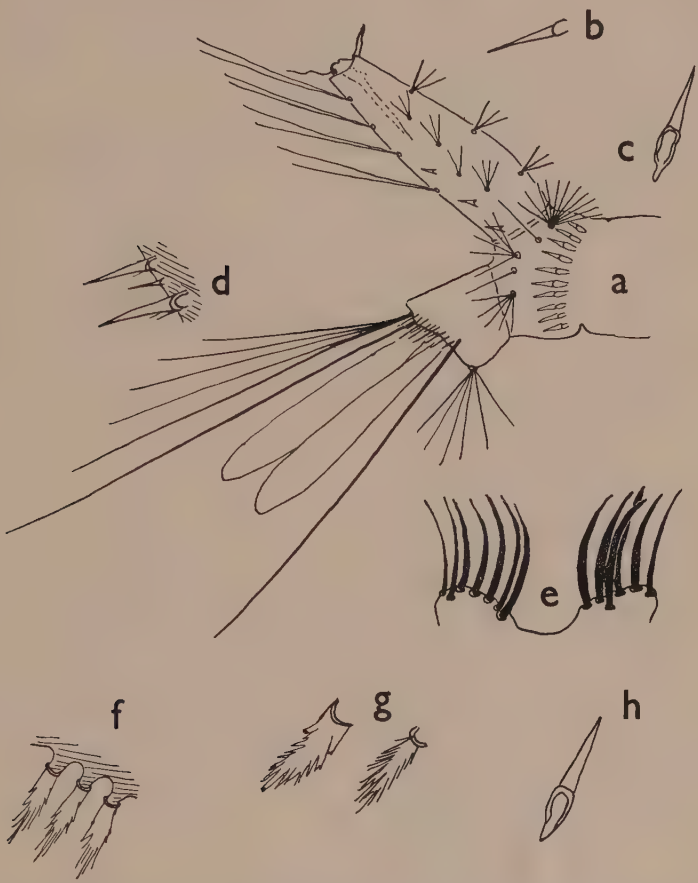

FIG. 12.—(*a*)–(*e*) *Tripteroides* (*Mimeteomyia*) *standfasti* sp. n. : (*a*)–(*d*) larva : (*a*) anal segments ; (*b*) pecten spine ; (*c*) comb spine ; (*d*) saddle spines. (*e*) Male terminalia. (*f*)–(*h*) *T.* (*M.*) *argenteiventris* (Theobald). Larva : (*f*) saddle spines ; (*g*) pecten spine ; (*h*) comb spine.

basal denticles, hair 2 with 5 branches, hair 3 longer than lateral seta, hair 4 (ventral brush) with 6 rather short branches, anal gills two and a half times saddle length, round ended. (*Note :* the comb, pecten and saddle spines of *T. argenteiventris* (fig. 12*f*, *g*, *h*) are illustrated for comparison.)

Pupa (fig. 13*a*).—*General appearance :* very pale integument, trumpets and hairs, similar to *T. argenteiventris* (fig. 13*b*) but separated from this by details of chaetotaxy on segment II. *Cephalothorax :* 1(3b–l), 2(2b–l), 3(2b–s), 4(2b–s), 5(3b–s), 6(1–vs), 7, 9(1–ml), 8(2b–ml), 10(6b–s), 11, 12(1–ml). *Abdomen :* 0–II–VIII(1–m) ; 1–I(large, dendritic), II(4b–l), III(3b–l), IV–VI(2b–l), VII(1–l) ; 2–I–VII(1–s) ; 3–I(1–l), II, III(1–l, stouter), IV(2b–s),

V–VII(1–s); 4–I, II(2b–s), III–VII(1–s); 5–I(2b–s), II, III(2b–l), IV–VI(1–l, stout), VII(2b–s); 6–I(1–ml), II(1–l), III–VII(1–s); 7–I–V(1–s), VI(2f–l, plumose), VII(9b–l, slender), VIII(18b–l, slender); 8–III, IV, VII(2b–s), V, VI(1–s); 10–I(1–ml) II(1–ml, placed laterally), III (1–ml, placed more medially), IV(2b–ml), V, VI(1–ml, placed distally); 11–II–VII(1–s); 12–III–VIII(1–ml, medial to 11 on VI); 14–II–VIII(1–m). *Paddles :* rather pointed, with minutely spiculate distal edges.

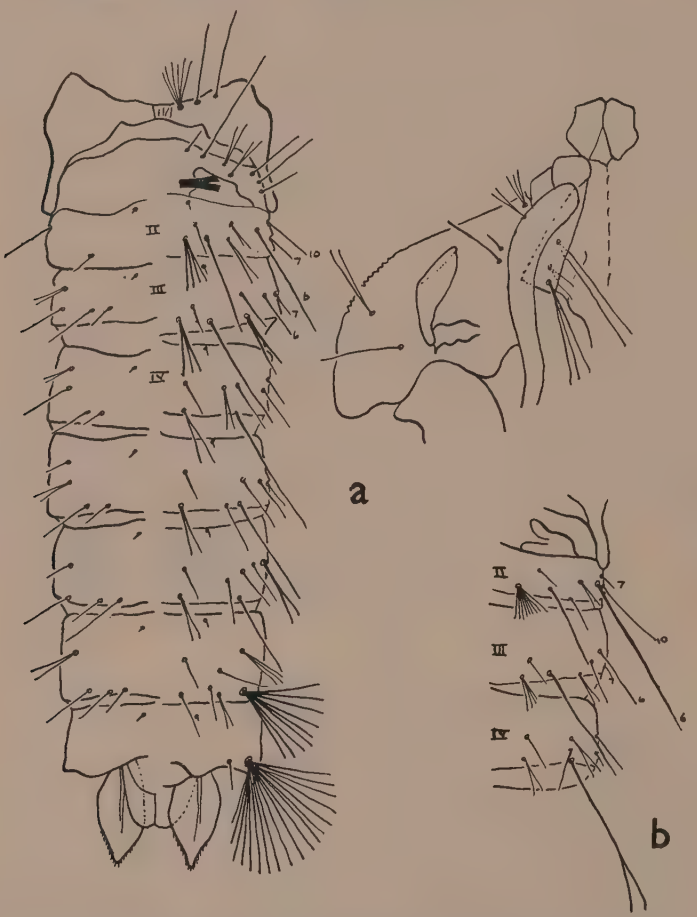

Fig. 13.—(*a*) *Tripteroides* (*Mimeteomyia*) *standfasti* sp. n. : pupa.
(*b*) *T.* (*M.*) *argenteiventris* (Theobald) : pupa, segments II–IV.

Male.—General appearance : a small mosquito with dark scutum, pale unbanded sternites, long proboscis and narrow-scaled wings. *Head :* palpi, proboscis and antennae slender, dark brown, clypeus dark brown, small, pedicels lighter brown, very large; antennae with dense whorls, slightly shorter than the palps, palps 81 per cent. of proboscis length and proboscis equal in length to fore femur; head scales flat, light brown with a few pale flat scales near the vertex only visible in certain lights, a rim of white scales on the ocular margin which broadens to form white patches at the sides of the head, a pair of golden bristles on the mid-line pointing forward and 3 or 4 on the ocular margins, a row of dark upright scales on the nape, the centre scales pale. *Thorax :* integument dark brown,

scutal scales fairly large but narrow, curved, light brown except on the anterior margin and pre-alar areas of the scutum, where there are distinctive patches of white scales; a double row of strong dorsocentral bristles present, 3 pairs of prescutellars, scutellum with light brown flat scales, mid-lobe with a number of fine bristles projecting posteriorly; pleurae white-scaled on a dark brown integument except on the antero-ventral sternopleura, which is bare, and the upper half of the pronotum where the scales are light brown; 1 postpronotal bristle, 1–3 spiraculars among a few hairlike white scales; mesopostnotum dark brown, bare. *Wings :* fairly densely scaled with some broad scales on vein 1 but narrow outstanding scales on all veins, upper fork cell 3 × stem, upper cross vein distal to lower, wing length 2·7 mm. *Legs :* coxae light brown with white scales on proximal parts, rest of legs dark brown but all femora pale beneath and tibiae beneath with a pale reflection, hind tibia 83 per cent. of mid-tibia. *Abdomen :* 1·1 times proboscis length, tergites dark brown except for a basal row of pale scales on II and lateral pale scales on I, pale hairs on I; sternites uniformly white-scaled and these scales extending a short way dorsally on the basal half of the segments, giving an irregular dentate appearance, a number of white hairs on all sternites; terminalia, tergite IX with shallow depression between the two halves, 6–7 spines with the bases set unevenly, the lateral spines narrower (fig. 12*e*).

Female.—General appearance as in the male. *Head :* palpi one-tenth the proboscis length and exceeding the clypeus by the length of the latter, proboscis 1·3 × fore femur and 1·2 × abdomen. *Thorax :* scutal scaling darker and no pre-alar white scaling, 3–5 pairs of prescutellar bristles, 1–2 pairs of dorsocentral bristles, 1 postnotal and 5 spiracular bristles. *Wing :* upper fork cell 3·1 × stem, wing length 2·9 mm. *Legs :* hind femur 87 per cent. length of mid-femur.

Described from holotype male and paedotype larval and pupal pelts; allotype female; 4 male, 3 female, 5 larval and 4 pupal paratypes.

Holotype ♂, New Guinea: Maprik, Sepik District, February, 1958, No. 103e, paedotype larval and pupal pelts on slide mount (from axils of *Curcuma* sp.) (*Dr. W. Peters*); *allotype* female, same locality data, January, 1958, No. 63f. *Paratypes*, same locality data, from *Curcuma* sp. and coconut shells. The holotype, allotype and paratypes will be deposited in the collection of the Division of Entomology, C.S.I.R.O., Canberra. Other material will be deposited in the British Museum (Nat. Hist.).

This species is named in honour of Mr. H. A. Standfast of this Department, who has undertaken the collection and link-breeding of much of the material in the Department's collection.

Locality and Breeding Site Records

Table I (page 154) summarises the records of all species of *Tripteroides* in the collection of the Department of Public Health. At least three other species have been found, but these are awaiting description by other workers.

Additions to Larval and Adult Keys of Lee (1946)

Larvae

Couplet 6. *Add :* Siphonal index 1·5; 5–6 dorsal hairs on siphon; 6–8 ventral tufts; apical pecten spine very strong; saddle hair with 3 branches . . . . . **plumigera**

Couplet 9. *Add :* Pecten in a double row; ventral siphonal valve hair single or double; dorsal lateral comb spines larger than the ventral . . . . . **leei**

Couplet 22. *Change to :* All or most of the lateral comb spines sharply pointed 23
Lateral comb scales all blunt and fringed . . . **tasmaniensis**
23. Dark siphon ; spines on distal edge of saddle very jagged one-quarter maximum length of saddle **argenteiventris**
Pale siphon ; spines on distal edge of saddle smooth or with a few delicate denticles one-third to one-half maximum length of saddle . . . . . **standfasti**

Adults

Couplet 16, line 3. *Change to :* . . . male palpi two-thirds or more length of proboscis 17
Couplet 17. *For second half of couplet substitute :* Pleural integument medium brown ; hind tibia 88 per cent. length of mid ; lobes of ninth tergite of only moderate length with 8 or 9 spines of even length ; male palp 82 per cent. length of proboscis ; *ufc* 2·7 × stem . . . . . **longipalpata**
Pleural integument medium brown ; hind tibia 88 per cent. length of mid ; lobes of ninth tergite of only moderate length with 7 uneven spines ; male palp 75 per cent. length of proboscis ; *ufc* 1·75 × stem . . . . . **leei**
Couplet 22. *Add :* Female palpi less than one-quarter length of proboscis (male palpi one-quarter) ; 1–4 spiraculars ; 2–3 pairs of prescutellars ; posterior pronota dark-scaled above **plumigera**
Couplet 38. After second half of couplet, *change :*
" . . . *argenteiventris* " to read " . . . . . 39 "
Add : 39. No dorsocentral bristles ; male palps 90 per cent. length of proboscis . . . . . **argenteiventris**
Dorsocentral bristles present ; male palps 81 per cent. length of proboscis . . . . **standfasti**

Key to Pupae of New Guinea Species

Insufficient material was available to make a key to the subgenera. All the points considered in this key can be recognised at a magnification of × 50.

1 Tips of paddles concave 2
Tips of paddles not concave 3
2 Hair 1 on II–VII with 3 or 4 branches . . . . . **brevipalpis**
Hair 1 on II–VII single or double . . . . . **bimaculipes quasiornata**
3 Hair 7 on III–VI well developed 4
Hair 7 on III–VI very small 6
4 Hair 2 on III–VI or VII stellate, thick and plumose . . . **bisquamata**
Hair 2 on these segments simple 5
5 Hair 6 on II well developed . . . . . **plumigera**
Hair 6 on II poorly developed . . . . . **brevirhynchus**
6 Hair 1 on cephalothorax not very long, with about 3 branches . **standfasti**
Hair 1 on cephalothorax very well developed, with 1 or 2 branches . 7
7 Hairs 3 and 5 on III not well developed . . . . . **alboscutellata magnesiana**
Hair 3 on III well developed, but not hair 5 8
Hairs 3 and 5 on III both well developed 10
8 Paddles distinctly rounded . . . . . **filipes**
Paddles ovate 9

9	Hair 6 on II well developed	**argenteiventris**
	Hair 6 on II poorly developed	**fuscipleura**
10	Hairs 3 and 5 on III equal in length	**longipalpata**
	Hair 5 on III much longer than 3	**leei**

Acknowledgments

The author is especially indebted to Mr. H. A. Standfast and his staff for the collecting and rearing of much of the material described. The co-operation and advice of the following are gratefully acknowledged : Mr. D. J. Lee for permission to examine material in the collection of the School of Public Health and Tropical Medicine, Sydney, and for much helpful criticism ; Mr. K. L. Taylor and Mr. A. Dyce of the C.S.I.R.O., Canberra, for permission and assistance in examining material in the C.S.I.R.O. collection ; and Dr. E. N. Marks of Queensland University for much helpful criticism. I should also like to express my appreciation of the constant encouragement given by my wife throughout these studies. This paper is published by kind permission of the Director of Public Health of the Territory of Papua and New Guinea.

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Corrigendum

In the first paper of this series (*Proc. R. ent. Soc. Lond.* (B) **27** : 89–92) the writer described the male of *Aëdes* (*Leptosomatomyia*) *variepictus* King and Hoogstraal, 1946. Dr. E. N. Marks and Mr. P. F. Mattingly have since shown that this is not the correct identification and that the male of *variepictus* remains unknown. The species described is therefore unnamed and will be dealt with in more detail at a later date in a paper revising the entire subgenus.

Dr. E. N. Marks and Mr. J. van den Assem have kindly pointed out an error in the nomenclature of *Culex* (*Culiciomyia*) *ruthi*. This is now renamed *Culex* (*Culiciomyia*) *ruthae* **nom. nov.**

TABLE I

Species	Localities and months	Breeding sites	Associated species
T. (T.) alboscutellata	Maprik iii iv ix	Bamboos, tree holes, small taro axils	*T. bisquamata Aë. scutellaris Aë. notoscriptus U. diagonalis Aë. aurimargo Tox. splendens*
T. (T.) bimaculipes	Maprik i–xii Wagawaga x Mapamoiwa x	Bamboos, tree holes, sago leaf, bottles	*T. quasiornata T. bisquamata Aë. albolineatus notoscriptus aurimargo argenteitarsis scutellaris Tox. splendens U. nigerrima U.* nr. *diagonalis C. brevipalpis*
T. (T.) elegans .	Wewak i viii–xii Maprik i–iv xi–xii	?	.
T. (T.) magnesiana	P. Moresby, iii ? Gulf District	?	.
T. (T.) quasiornata .	Maprik vii viii Mapamoiwa x Wagawaga x	Bamboos, tree holes, root buttresses	*T. bimaculipes C. brevipalpis Aë. albolineatus*
T. (R.) bisquamata .	Hollandia iv Sogeri iv Losuia x Crater L. Fergusson I. x Maprik i–xii	*Nepenthes* spp. Bamboos, tree holes, coconut shells, tins, taro axils	*H. leei Aë. kochi scutellaris notoscriptus aurimargo U. nigerrima diagonalis albescens Tox. splendens Trip. leei standfasti filipes alboscutellata bimaculipes longipalpata plumigera C. brevipalpis*
T. (R.) brevirhynchus	Minj ii vi	*Nepenthes* sp.	.
T. (R.) filipes .	Yambi (Maprik) iii Sogeri viii Minj vi	*Nepenthes* spp.	*T. bisquamata*
T. (R.) fuscipleura .	Maprik v–x Dreikikir v	Wild taro spp., small taro spp.	*H. leei Aë. kochi*
T. (R.) longipalpata	Maprik i iii iv Yambi vi	*Nepenthes* spp., bamboos, tree holes	*Aë. aurimargo albolineatus C. brevipalpis T. bisquamata plumigera*
T. (R.) plumigera .	Maprik v Yambi vi	Tin, *Nepenthes* sp.	*T. bisquamata longipalpata*
T. (R.) leei . .	Maprik i	Tree holes, bamboos, *Curcuma* sp.	*T. bisquamata standfasti U. diagonalis Aë. kochi scutellaris albolineatus*
T. (M.) microlepis .	Tari vii	?	.
T. (M.) standfasti .	Maprik i ii	*Curcuma* sp., coconuts	*Aë. kochi U. nigerrima diagonalis argyrotarsis T. leei*
T. (M.) argenteiventris	Maprik iv	Tree holes	*C. brevipalpis*

Book Notices

Bumblebees. By John B. Free and Colin G. Butler. With two appendices by Ian H. H. Yarrow. 8vo. London (Collins), 1959. Pp. xiv, 208; 24 pls., text illust. [*The New Naturalist*, 40.] 25*s*.

In this latest volume in the *New Naturalist* series, the authors aim to give a complete and up-to-date picture of the behaviour and social life of British Bumblebees, and to cover the considerable advances in knowledge which have been made since the publication of F. W. L. Sladen's *The Humble-bee* in 1912. Scientific terminology has been restricted to a minimum, but Linnean names are used to identify the different species.

Each chapter has been made as complete as possible in itself without disturbing the continuity of the whole. The first few deal with the history of a bumblebee colony and are followed by others on recognition and friendship, cuckoo bumblebees, enemies, collection of food, locality learning and economic importance.

There are two appendices giving valuable information on collection and maintenance of colonies in captivity, as well as appendices by Dr. Yarrow on the identification and distribution of all the British species together with a glossary of terms. A detailed subject index and a bibliography complete the work.

The World of Insects. By Paul Pesson, trans. by R. B. Freeman. 4to. London (Harrap), 1959. Pp. 204 : 228 photos (52 col.). [*Living Nature Series.*] £3 3*s*.

This work in the *Living Nature Series* contains numerous excellent photographs in black and white, and colour, depicting the life and habits of insects ; those of insects shown in close-up are particularly striking.

The text by Paul Pesson is divided into four sections—" The Nature of Insects ", relating them to other Arthropods and discussing their ancestry ; "History and Evolution ", including information on variation and adaptation, polymorphism, protective coloration and mimicry ; "The Life of Insects ", covering respiration, conservation of water, temperature relationships, climate, reproduction, embryology and development, sense organs and behaviour ; and finally "Insects and Man " in which are mentioned the various diseases harmful to man and plants which are transmitted by insects and the methods used to control them.

A selected list of references and an index complete the work.

Book Notice

Obligatory and Facultative Insects in Rose Hips: their Recognition and Bionomics. By W. V. Balduf. 8vo. Urbana (Univ. Illinois Pr.), 1959. Pp. 194: 12 pls. [*Illinois biol. Monogr.* 26.] $4.50.

This work is the outcome of researches made by the author between 1944 and 1953, the principal objectives of which were to learn what species of insects depend more or less on rose hips for their food and/or shelter, their bionomic relations to the hip or to each other, and the life histories of each species.

Samples of hips were taken from 32 species or varieties of roses, chiefly from Minnesota, Wisconsin and Illinois, and about 14,000 adult specimens of rose hip insects were reared, and thousands of larvae of the phytophagous species were dissected to obtain the endoparasitic larvae. Altogether 45 species of animals were found to be associated with rose hips.

Exhaustive technical descriptions have not been included but the characteristics described are intended to enable the several stages of any one species to be distinguished from those of the others. There is an extensive bibliography and a list of rose hosts of hip insects.

KEY TO THE SPECIES OF *AUSTROMENOPON* BEDFORD (MALLOPHAGA) PARASITIC ON THE CHARADRIIFORMES

By Theresa Clay
(*British Museum (Natural History)*)

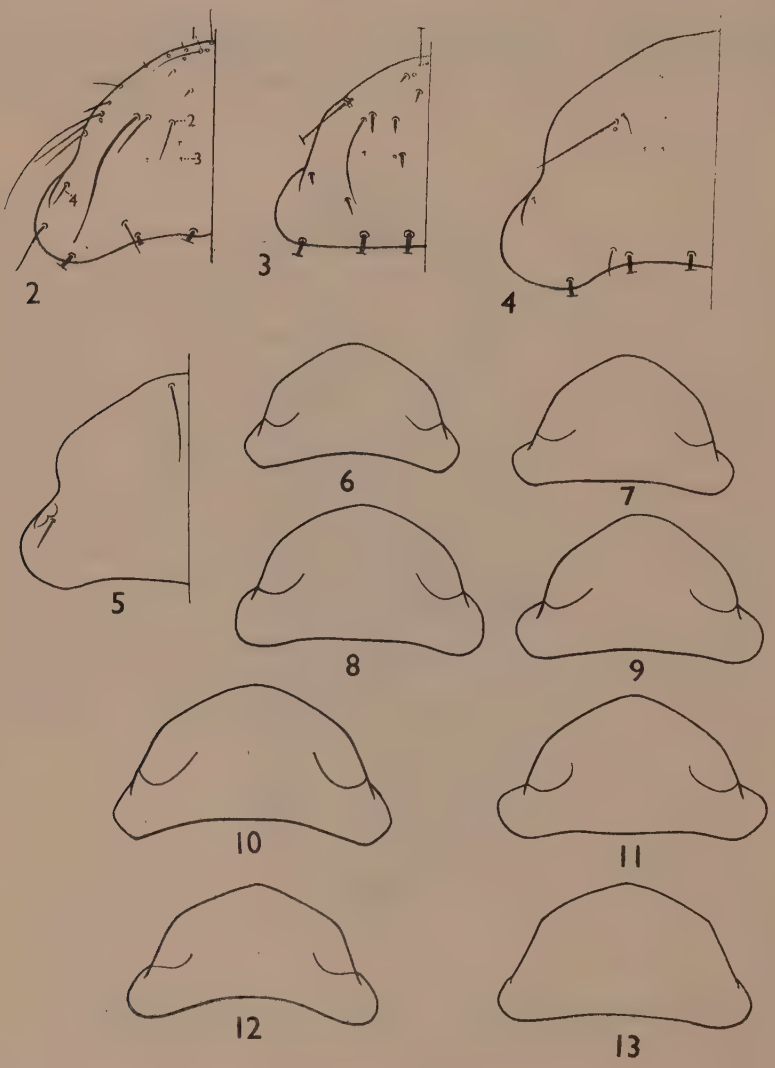
While considering the diagnosis of *Austromenopon phaeopodis* (Schrank) for inclusion in Part IV of the *Early Literature of the Mallophaga* now in preparation, various characters were found which made it possible to separate in the form

Fig. 1.—*Austromenopon phaeopodis* (Schrank, 1802): male.

of a key both males and females of most of the species of *Austromenopon* Bedford parasitic on the Charadriiformes. As this key may be of use to other workers, especially those wishing to describe new forms, it is given below, together with notes on some of the species. Owing to the inadequacy of the original descriptions of the species of *Austromenopon* it has been necessary,

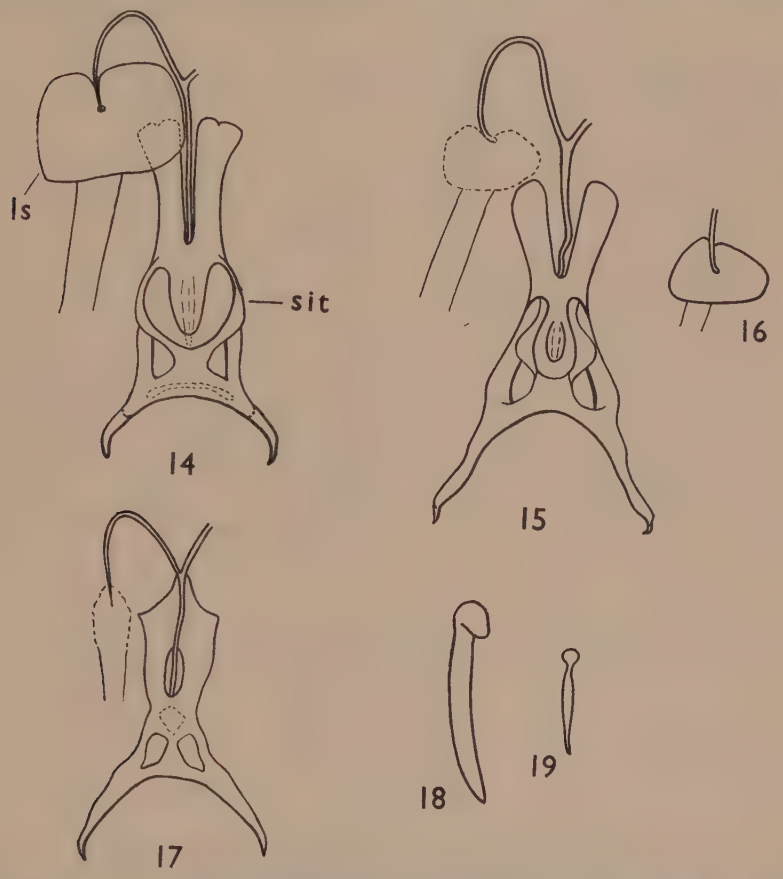
where the types are not available, to assume that specimens from a type host of a particular species are that species and to base the diagnosis of the species on these specimens.

The most important diagnostic characters are the degree of development of the hypopharynx, the dorsal setae of the head and prothorax, the lateral abdominal thickening, the male genitalia, the vulva and the ventral sclerites



FIGS. 2–13 —(2–5) Heads of male *Austromenopon* spp. to show diagnostic dorsal setae: (2) *A. phaeopodis*, 1–4 dorsal head setae (*d.h.s.*); (3) *A. nigropleurum* (size of setae somewhat exaggerated); (4) *A. cursorius*; (5) *A. durisetosum*. (6–13) Outline of heads of *Austromenopon* spp.: (6) *A. atrofulvum*, ♂; (7) *A. aegialitidis*, ♀ from *Charadrius vociferus*; (8) *A. gregariae*, ♀; (9) *A. leucurae*, ♀; (10) *A. haematopi*, ♀; (11) *A. squatarolae*, ♀; (12) *A. atrofulvum*, ♀; (13) *A. micrandum*, ♀.

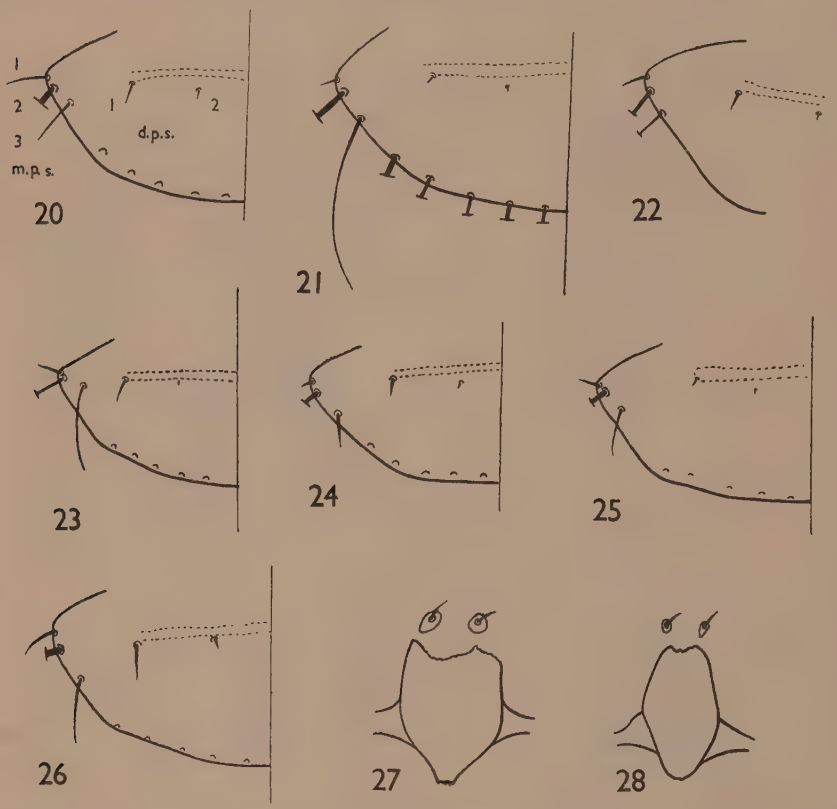
of the terminal segments of the female abdomen. The degree of development of the hypopharynx does not seem to be a character of phylogenetic value, as it is so different in the otherwise rather similar species, *A. phaeopodis* and *A. crocatum*, found on different species of *Numenius*. It has not been possible to separate all the described forms in the key, owing to the apparent variation



FIGS. 14–19.—(14–17) Hypopharynx of female *Austromenopon* spp. (dissected specimens): (14) *A. phaeopodis*. *ls.*, lingual sclerite; *sit.*, sitophore; (15) *A. transversum* from *Larus ridibundus*; (16) *A. fuscofasciatum* from *Stercorarius parasiticus*; lingual sclerite; (17) *A. limosae*. (18–19) "Pestle" or epipharyngeal crest: (18) *A. phaeopodis*; (19) *A. transversum*.

of certain characters and the small numbers of specimens from some of the type hosts. The following characters were found to show too much individual variation to be of diagnostic value: number of setae on the gular plate; dorsal mesothoracic setae; size and number of the abdominal tergal setae and number of rows of abdominal sternal setae. There is frequently minor variation in the length of marginal prothoracic seta 3 (*see Note* 1) and its length relative to the length of marginal prothoracic seta 1 or dorsal prothoracic seta 1, and these

relative lengths which may be reasonably constant throughout certain populations are not invariable (*see Note* 11). The shape of the head and of the prothorax is liable to distortion in mounted specimens and the apparent shape of the sclerites in the genital sac of the male is variable owing to the position in which these may lie in the mounted specimen.



Figs. 20–28.—(20–26) Prothorax of male *Austromenopon* spp. to show diagnostic dorsal setae: (20) *A. phaeopodis* (*m.p.s.*, marginal prothoracic setae 1–3; *d.p.s.*, dorsal prothoracic setae 1–2); (21) *A. transversum* from *Rissa tridactyla*; (22) *A. fuscofasciatum* from *Stercorarius parasiticus*; (23) *A. durisetosum*; (24) *A. himantopi*; (25) *A. haematopi*; (26) *A. crocatum*. (27–28) Female prosternal plate: (27) *A. atrofulvum* from *Sterna fuscata*; (28) *A. himantopi*.

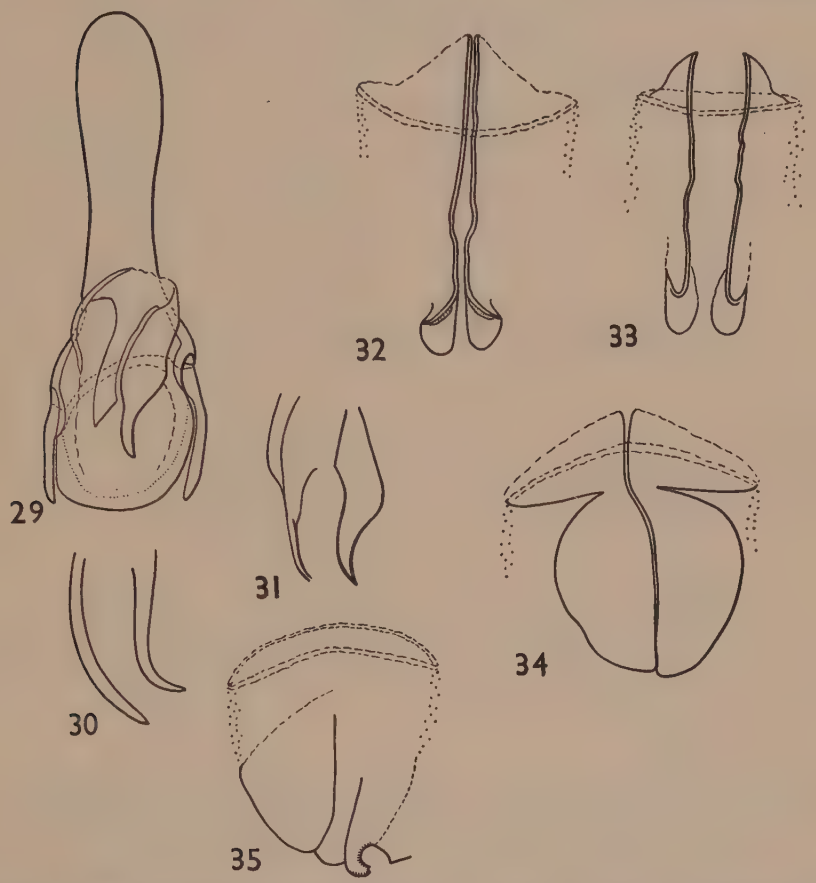
Key to the Species of *Austromenopon* Bedford*

1		*M.p.s.*[1] *3* reaches to metathorax (fig. 21)	2
–		*M.p.s. 3* does not reach to metathorax (fig. 20)	4
2	(1)	Sclerites of hypopharynx[2] (fig. 14) and epipharyngeal " pestle " (fig. 18) fully developed, or if these sclerites reduced then internal pleural thickening[3] II–VIII large relative to size of pleurite . . Species from *Phaethon* and some Procellariformes[4]	

* Small numbers refer to notes on pp. 164–165.

– Sclerites of hypopharynx (fig. 15) and epipharyngeal " pestle " (fig. 19) show some reduction ; internal pleural thickening small or absent 3

3 (2) Inner surface of pleurites with definite semicircular markings (more marked in female than in male); relative lengths of *d.p.s.* and *m.p.s. 1* as in figure 22 . . . . . **fuscofasciatum**[5]



FIGS. 29–35.—Male genitalia of *Austromenopon* spp. : (29) *A. phaeopodis* ; (30) *A. limosae*, tips of parameres. (31–35) Sclerites of genital sac : (31) *A. sachtlebeni* ; (32) *A. micrandum* ; (33) *A. himantopi* ; (34) *A. haematopi* ; (35) *A. atrofulvum*. (Figs. 32–35 drawn to same scale).

– Inner surface of pleurites without pattern of thickening, relative lengths of *d.p.s.* and *m.p.s. 1* as in figure 21 . . **transversum**[5]

4 (1) Sclerites of hypopharynx (fig. 14) and epipharyngeal " pestle " (fig. 18) fully developed 5

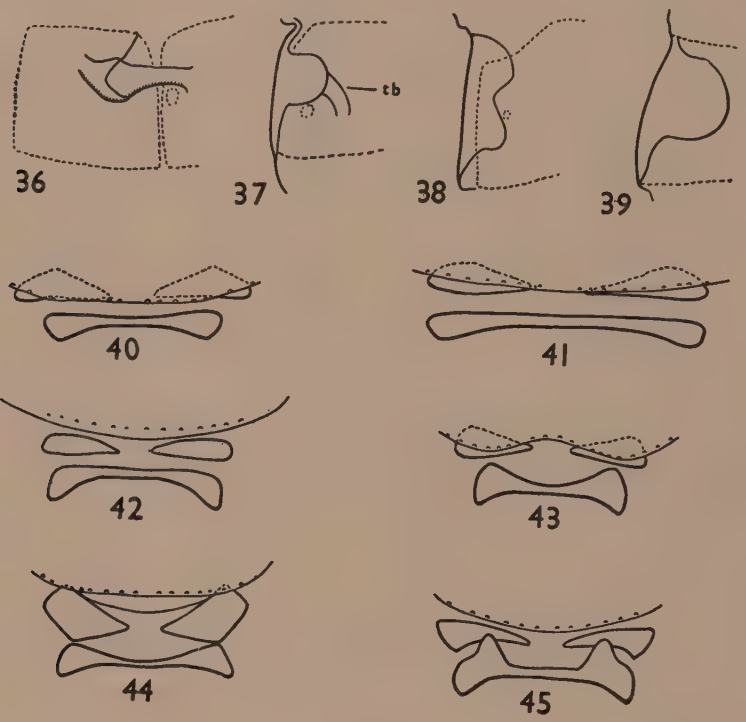
– Sclerites of hypopharynx reduced to a greater or lesser extent (fig. 17) ; "pestle" small or not apparent 7

5 (4) Relative lengths of *d.p.s. 1 & 2* and *m.p.s. 3* approximately as in figure 20 ; inner pleural thickening of VIII not large relative

to size of pleurite ; tergites with single row of setae ; sclerites of genital sac as in figures 29, 31 6

– Without above combination of characters
Some species from Procellariformes

6 (5) Sclerites of male genital sac as in figure 29 ; female vulval margin straight (fig. 40) . . . . . **phaeopodis**



Figs. 36–45.—(36–39) Inner pleural and tergal thickening of female abdomen: (36) *A. phaeopodis*, inner view of pleurite and lateral part of tergite VI from female in which abdomen has been split down centre and mounted flat on side ; (37) *A. phaeopodis*, normal view of lateral thickening of segment V (*tb.*, tergal bar) ; (38) *A. corporosum*, pleural thickening of segment III ; (39) *A. madagascariensis*, pleural thickening of segment IV. (40–45) Edge of vulva and terminal ventral sclerites of female abdomen of *Austromenopon* spp. : (40) *A. phaeopodis* ; (41) *A. crocatum* ; (42) *A. meyeri* ; (43) *A. lutescens* ; (44) *A. limosae* ; (45) *A. gregariae*.

– Sclerites of male genital sac as in figure 31 ; female vulval margin slightly concave medially . . . . . **sachtlebeni**

7 (4) Some of the dorsal head setae spine-like, *d.h.s. 3* spine-like with adjacent sensilla (fig. 3) . . . . . **nigropleurum** group[6]

– Dorsal head setae not as above 8

8 (7) *D.h.s. 2* minute (fig. 4) (*d.h.s. 4* short ; *m.p.s. 3* reaches to or nearly to end of lateral margin of prothorax ; lateral abdominal thickening well developed) . . . . . **cursorius**

– *D.h.s. 2* not minute (fig. 2) 9

9 (8) *M.p.s. 3* thin, reaches to or nearly to end of prothorax and its alveolus is submarginal near that of *m.p.s. 2*; *d.h.s. 1 & 4* long (fig. 5); inner lateral thickening well developed on II–VIII; genital sac without the heavily sclerotized pointed sclerite shown in figure 29; female ventral sclerites not as in figure 41 **icterum, durisetosum**[7]

– Without above combination of characters 10

10 (9) Pleural thickening of abdominal segments II–VII bilobed (fig. 38). (Female vulval margin concave medially) **corporosum**[8]

– Pleural thickening of abdominal segments II–VII not bilobed . 11

11 (10) Males 12

– Females 22

12 (11) Genital sac without heavily sclerotized sclerite or sclerites, but with lightly sclerotized bilobed structure (figs. 32–34) . . . 13

– Genital sac with heavily sclerotized sclerite (fig. 35) or sclerites (fig. 29) 16

13 (12) Sclerites of genital sac as in figures 32–33; *m.p.s. 3* rather stout; *d.p.s. 1* equal to or longer than *m.p.s. 1* (fig. 24) . . 14

– Sclerites of genital sac as in figure 34; prothoracic setae not as above (fig. 25) 15

14 (13) Sclerites of genital sac as in figure 32 . . . . . **micrandum**[9]

— Sclerites of genital sac as in figure 33 . . . . . **himantopi**[9]

15 (13) Head rather pointed anteriorly (as in female, fig. 11) **squatarolae**[12]

— Head rounded anteriorly (as in female, fig. 10) . . . **haematopi**[12]

16 (12) Genital sac with single sclerite with blunted, pointed or hook-like end and with bilobed hyaline thickening, but without other heavy sclerotization (fig. 35) 17

— Genital sac with sclerite with blunted, pointed or hook-like end and with other parts of sac strongly sclerotized (fig. 29) . . 19

17 (16) Abdominal segment V with definite tergal bar[3] 18

— Abdominal segment V without definite tergal bar; head as in figure 6 . . . . . **atrofulvum**[10]

18 (17) Pleural thickening, including that of VIII, large relative to size of pleurite (fig. 39) . . . . . **madagascariensis**

— Pleural thickening not as above . . . . **aegialitidis** group[11]

19 (16) Tip of left paramere narrow and curved outwards (fig. 30) . **limosae**

— Tip of left paramere not as above 20

20 (19) Abdominal segments VII & VIII with well-marked tergal bar and pleural thickening 21

— Abdominal segments VII & VIII without well-marked tergal bar and pleural thickening . . . . . **lutescens**[13]

21 (20) *M.p.s. 3* reaches beyond alveolus of outer seta of posterior margin; *m.p.s. 1* and *d.p.s. 1* approximately the same length (fig. 26); genital sac with pointed sclerite . . . . . **crocatum**

— Prothoracic setae not as above; genital sac with hook-like sclerite . . . . . **meyeri**

22 (11) Last ventral abdominal sclerite not greatly enlarged at each end, penultimate sclerite characteristic (fig. 41) . . . . . **crocatum**

— Last ventral abdominal sclerite with straight upper margin and end prolonged posteriorly only, penultimate sclerite characteristic (fig. 42) . . . . . **meyeri**

— Last ventral sclerite with ends produced anteriorly and posteriorly (figs. 43–45) 23

23 (22)	Vulval margin markedly concave centrally; prosternal plate similar to figure 27, not figure 28	**lutescens**
—	Vulval margin not markedly concave, if slightly concave, prosternal plate similar to figure 28	24
24 (23)	Penultimate ventral abdominal sclerite elongated (fig. 45)	25
—	Penultimate ventral abdominal sclerite not elongated, shape characteristic (fig. 44)	**limosae**
25 (24)	Internal pleural thickening, including that of VIII, large relative to size of pleurite (fig. 39)	**madagascariensis**
—	Internal pleural thickening not as above	26
26 (25)	Segment VI with definite lateral tergal bar	**aegialitidis**[11, 12]
—	Segment VI without definite lateral tergal bar	27
27 (26)	Prothoracic sternal plate broad and scarcely narrowed anteriorly (fig. 27); outline of head characteristic (fig. 12)	**atrofulvum**[10]
—	Without above combination of characters (figs. 28, 13)	28
28 (27)	Vulval margin slightly concave centrally	**himantopi**
—	Vulval margin not concave centrally	**micrandum**

Notes

1. Diagnostic setae are referred to as follows: *d.h.s. 1–4*, dorsal head setae, as shown in figure 2; *m.p.s. 1–3*, marginal prothoracic setae; and *d.p.s. 1–2*, dorsal prothoracic setae, as shown in figure 20.

2. The terminology for the sclerites of the hypopharynx is that used by Snodgrass (1944); the " pestle " is the epipharyngeal crest of Symmons (1952). It should be noted that the figures (14–17) are drawn from the hypopharynx removed from the head, and thus this organ may appear somewhat different when viewed in the whole insect, as the posterior part may lie partly under the anterior part.

3. The majority of the species of *Austromenopon* have an internal pattern of thickening along the lateral edges of the abdomen; part of this thickening lies on the inside of the pleurite and part on the inside of the lateral end of the tergite; this is shown in figure 36, where the lateral edge of the abdomen has been opened and flattened out. The tergal thickening often forms a definite bar, here referred to as the tergal bar (fig. 37, *tb.*). Owing to the lateral thickening being partly tergal and partly pleural, its appearance may vary in different specimens with the amount of pressure and subsequent distortion exerted on the abdomen during mounting on the slide.

4. It has not been possible to find a definite group of characters which would separate all the species parasitic on the Procellariformes from those on the Charadriiformes, and it is therefore considered that *Procellariphaga* Eichler, 1949, should not be maintained as a separate genus.

5. No critical work has be done on the populations from the different species of the Larinae, and Timmermann (1954 : 204) has been followed in placing all the species described from the various members of this subfamily as synonyms of *A. transversum* (Denny, 1842). Specimens from the Stercorariidae, however, were found to be distinct and are placed in the key under *A. fuscofasciatum* (Piaget, 1880); *A. circinatum* (Piaget, 1890) is a synonym. In addition to the characters given in the key to separate the two species, it seems that in specimens from the Stercorariidae the lingual sclerites are somewhat more heavily sclerotized and thus have a more distinct outline (fig. 16).

6. The *nigropleurum* group. *Austromenopon* specimens from the Alcidae are distinctive in having many of the dorsal setae of the head spine-like (fig. 3). No attempt has been made to study the populations parasitic on the various members of the Alcidae to see whether these are subspecifically distinct. *A. fraterculae* Timmermann, 1954, cannot be included in this group, and there seems little doubt that the single specimen on which this species was based is a straggler from one of the petrels, almost certainly *Puffinus p. puffinus*.

7. Only three females have been seen from the type host of *icterum* and, as these are near the females of *durisetosum* (but somewhat larger), it is probable that the male of the former species would be included in the key at this point.

8. There is insufficient material available to show whether *A. spenceri* Timmermann, 1956, can be separated from *corporosum*.

9. Only two males have been seen from the type host of *micrandum*, and it is not possible to be certain from this material whether the apparent differences in the sclerites of the genital sac between this species and *himantopi* are real or due to distortion during the preparation of the specimens. Although measurements of head width in the Menoponidae may be misleading, it appears that this measurement is greater in *micrandum*. A single male from *Recurvirostra americana*, the type host of *indistinctum*, is in too poor condition to decide whether it differs from males of *micrandum*.

10. No critical examination has been made of the populations from the various species of the Sterninae. The alleged type host of *A. atrofulvum* (Piaget, 1880), i.e. *Platalea leucorodia*, is obviously a mistake and the type material, as pointed out by Timmermann, 1954 : 201, must have come from one of the Sterninae ; it is the earliest name for the species of *Austromenopon* found on this subfamily. The measurements of the lectotype and paratypes fall within the range of those of specimens from *Thalasseus bergi*. Until the variation in size and chaetotaxy within the populations from the various members of the Sterninae is known it is not possible to decide whether more than one form will be taxonomically recognisable. Only one other name has been used, that is *A. sternophilum* (Ferris, 1932) from *Sterna fuscata* : if this proves to be separable it will not be more than subspecifically distinct, so that *atrofulvum* should be used as the specific name for populations found on *Sternus* and *Thalasseus*. *A. pachypus* (Piaget, 1888), alleged to have come from *Sterna hirundo*, is represented in the Piaget collection by a single nymph (*see* Clay, 1949 : 901) ; this specimen resembles both third instar nymphs and adults of the species usually found on *Larus* (i.e. *A. transversum*) in the form of the hypopharynx and chaetotaxy of the prothorax and differs in these characters from nymphs and adults of the species usually found on *Sterna* ; it must be presumed that this nymph is a straggler from one of the Larinae and the name can be sunk as a synonym of *transversum* (Denny).

11. The *aegialitidis* group. It has not been possible to separate in the key the members of this group. It includes the described species *aegialitidis*, *leucurae* and *gregariae* and the populations parasitic on *Hemiparra*, *Hoplopterus*, *Stephanibyx*, *Rhinoptilus*, *Vanellus* and probably other genera. Although it is usual in specimens from *Charadrius* for *m.p.s. 3* to equal or to be only slightly longer than *d.p.s. 1* and thus to differ from the type material of *leucurae* and *gregariae*, in which *m.p.s. 3* is noticeably longer than *d.p.s. 1*, there is some variation in the length of *m.p.s. 3* in the populations from *Charadrius* and, further, the population from *Hoplopterus* tends to be intermediate in this character. There may be diagnostic characters in the shape of the sclerite of the genital sac, but this appears different in different specimens according to how it is lying, so that on the present material it cannot be used. The three described species can be separated on the shape of the head (figs. 7, 8, 9), but specimens of other populations have heads of intermediate shape and size. A further revision of the characters and their variation based on a greater number of specimens of all these populations must be undertaken before any adequate classification can be made. Until then these populations can be included in the species *aegialitidis*, as any future divisions are unlikely to be of more than subspecific rank.

12. In the females no reliable characters have been found to separate *haematopi* and *squatarolae* from all the populations discussed under Note 11 above. Although these two species can be separated from the named populations of the *aegialitidis* group in having *m.p.s. 1* obviously longer than *d.p.s. 1*, they are not distinguishable in this character from the females of some of the other populations. There are some differences in the shape of the heads (figs. 7–11).

13. The *lutescens* group. This includes *A. lutescens* (Burmeister) from *Philomachus pugnax*, *A. alpinum* Timmermann from *Calidris alpina*, and the populations from *Crocethia alba*, *Arenaria* and *Tringa*. Except for *lutescens*, too little material of this group has been seen to make a decision on the status of these populations.

Neotype of *Austromenopon phaeopodis* (Schrank)

Pediculus phoeopodis (sic) Schrank, 1802. *Briefe naturhistorischen, physikalischen und oekonomischen Inhaltes an Herrn Nau.* Erlangen : 361.

The host is given as *Scolopax phaeopas* L. (*Numenius p. phaeopus*), so that the name must obviously be a misprint for *phaeopodis*. The long and fairly detailed description leaves little doubt that it refers to a species of *Austromenopon*; it was used in this sense by Hopkins and Clay (1952 : 49), where the spelling was emended, and by Timmermann (1954 : 203) in his revision of *Austromenopon*. *Menopon ambiguum* Nitzsch (Giebel, 1874 : 295) from the same host is also an *Austromenopon* and a synonym of *phaeopodis*.

The characters separating this species from other known species of *Austromenopon* have been given above in the key.

Measurements in mm.

	Male		Female	
	Length*	Breadth	Length	Breadth
Head . .	0·27	0·50	0·32	0·57
Prothorax .	.	0·37	.	0·46
Metathorax .	.	0·44	.	0·56
Abdomen .	0·89	0·65	1·27	0·87
Total . .	1·51	.	2·10	.
Genitalia . .	0·55	.	.	.

(* In mid-line ; genitalia to end of endomeral plate.)

Neotype ♂ (figs. 1, 2, 20, 29) and *neallotype* ♀ (figs. 14, 18, 36, 37, 40) of *Austromenopon phaeopodis* (Schrank) from *Numenius phaeopus* (L.) from Iceland : August, 1934, Meinertzhagen Collection, British Museum (Nat. Hist.), slide No. 2090. *Neoparatypes :* 8 ♂, 27 ♀ from the same host species from Iceland and Shetland.

Lectotype of *Menopon transversus* Denny

Female in the Denny Collection in the British Museum (Nat. Hist.), slide No. 503 from *Larus tridactylus* = *Rissa tridactyla*.

List of Species of *Austromenopon* Parasitic on the Charadriiformes

(Those names considered to be synonyms in Hopkins and Clay, 1952, are not repeated here. * denotes that the types have been seen ; † that specimens have been seen from the type host.)

Species	*Host and comments*
†*aegialitidis* (Durrant, 1906)	*Charadrius v. vociferus.* **Note 11.**
albemarlei (Kellogg and Kuwana, 1902) .	Unknown. It seems possible that this may be an *Eidmaniella* ; if not, it probably originated from one of the Procellariformes.
**alpinum* Timmerman, 1954	*Erolia alpina schinzi.* Included under the *lutescens* group. **Note 13.**
**atrofulvum* (Piaget, 1880)	Unknown. **Note 10.** Lectotype, *see* Clay, 1949 : 819.
cinerea (Thompson, 1939) . . .	Needs confirmation. At present unplaceable.
**circinatum* (Piaget, 1890) . . .	*Stercorarius pomarinus.* **Note 5.** Lectotype, *see* Clay, 1949 : 823.

confine (Blagoveshtchensky, 1948)	*Numenius tenuirostris.* Not identifiable from the description.
†*corporosum* (Kellog and Kuwana, 1901)	*Phalaropus fulicarius.*
†*crocatum* (Nitzsch, 1866)	*Numenius a. arquatus.*
†*cursorius* (Giebel, 1874)	*Cursorius c. cursor.*
†*durisetosum* (Blagoveshtchensky, 1948)	*Capella g. gallinago.*
**fraterculae* Timmermann, 1954	Described from a specimen believed to have come from *Fratercula arctica grabae*, but probably a straggler from a petrel. **Note 6.**
**fuscofasciatum* (Piaget, 1880)	*Stercorarius pomarinus.* **Note 5.** Lectotype, *see* Clay, 1949 : 829.
**gregariae* Timmermann, 1954	*Chettusia gregaria.* **Note 11.**
**haematopi* Timmermann, 1954	*Haematopus ostralegus.* **Note 12.**
**himantopi* Timmermann, 1954	*Himantopus h. himantopus.* **Note 9.**
†*icterum* (Burmeister, 1838)	*Scolopax r. rusticola.* **Note 7.** Female only seen.
†*indistinctum* (Kellogg, 1896)	*Recurvirostra americana.* **Note 9.**
†*infrequens* (Kellogg, 1896)	*Larus glaucescens.* **Note 5.**
lemniscatum (Enderlein, 1908)	*Larus dominicanus.* **Note 5.**
**leucurae* Timmermann, 1954	*Chettusia leucura.* **Note 11.**
**limosae* Timmermann, 1954	*Limosa limosa.*
†*lutescens* (Burmeister, 1838)	*Philomachus pugnax.*
†*madagascariensis* (Mjöberg, 1910)	*Scopus umbretta.* A member of the Ciconiiformes, not the Charadriiformes. Incorrectly placed in *Ciconiphilus* by Hopkins and Clay, 1952 : 71.
**merguli* Timmermann, 1954	*Plautus alle.* **Note 6.**
†*meyeri* (Giebel, 1874)	*Limosa lapponica lapponica.*
micrandum (Nitzsch, 1866)	*Recurvirostra avosetta.* **Note 9.**
mohni Ansari, 1955	*Himantopus h. himantopus.* This (and *sohni*) was published three times as new species (Ansari, 1955, 1956 and 1957). In 1957 there is a figure in which the chaetotaxy of the prothorax is similar to that of *A. transversum*; however, if *m.p.s. 3* was missing from this specimen it is possible that *mohni* is a synonym of *himantopi* Timmermann.
†*nigropleurum* (Denny, 1842)	*Alca torda.* No type material in Denny Collection.
**pachypus* (Piaget, 1888)	*Sterna hirundo.* Error, *see* **Note 10.**
†*phaeopodis* (Schrank, 1802)	*Numenius p. phaeopodis.* Neotype designated above.
**ridibundus* (Denny, 1842)	*Larus ridibundus. See* **Note 5.**
**sachtlebeni* Timmermann, 1954	*Catoptrophorus semipalmatus inornatus.*
sohni Ansari, 1955	*Tringa ochropus.* Not identifiable from the description.
**squatarolae* Timmermann, 1954	*Squatarola squatarola.* **Note 12.**
**spenceri* Timmermann, 1956	*Lobipes lobatus.* **Note 8.**
†*sternophilum* (Ferris, 1932)	*Sterna fuscata oahuensis.* **Note 10.**
**transversum* (Denny, 1842)	*Rissa t. tridactyla.* **Note 5.** Lectotype designated above.
**uriae* Timmermann, 1954	*Uria aalge albionis.* **Note 6.**

Summary

A key to most of the species of *Austromenopon* parasitic on the Charadriiformes is given, with some discussion on the characters of taxonomic importance.

A list of species with notes is included. A neotype is designated for *A. phaeopodis* (Schrank) and a lectotype for *A. transversum* Denny.

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VARIATION IN *ANOPHELES FLAVICOSTA* EDWARDS FROM NORTHERN NIGERIA

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Regular collections of adult and larval *Anopheles* have been made in the Kaduna area since July, 1957. From January to March, 1958, a number of *Anopheles*, identified at the time as *A.* (*Myzomyia*) *moucheti* Evans, were caught biting humans and various animals exposed out of doors as bait. Since the larva of *A. moucheti* had not been found in the area, an intensive search was made in a large fadama[1] in the vicinity of the catching station. Diligent searching produced no *moucheti* larvae, but many *A.* (*Myzomyia*) *flavicosta* Edwards were found. Adults of *A. flavicosta* had not been recorded at bait during these months (although they had been collected biting humans out of doors between 7.0 p.m. and 2.0 a.m. in August, 1957, when specimens practically identical with the type described by Edwards (1911) were found), and they were therefore allowed to emerge from these larvae and identified by the use of De Meillon's key (1947). They proved to be *A. moucheti*.

Adults previously identified as "*moucheti*" from different parts of Zaria Province and three females from Birnin Kebbi, Sokoto Province, were identical with these adults bred from *flavicosta* larvae.

The fadama in which the *flavicosta* occurred was covered with tall grass and rush interspersed with open pools containing some emergent vegetation; it was intersected by a number of small streams. In the pools *A. rufipes* Gough and *A. squamosus* Theobald were common, with a few *A. maculipalpis* Giles. In the streams were *A rufipes*, *A. squamosus*, *A. coustani* Laveran and *A. funestus* Giles. *A. flavicosta* larvae were only obtained by trampling the tall grass and collecting in the shallow puddles thus formed; a few *A. squamosus* were also obtained in this way.

The description which follows is based on the examination of about 25 larval and pupal pelts from these *flavicosta* larvae and of the associated adults.

Larva

Agrees very closely with typical form described by Davey (1942), differing only in the branching of the saddle hairs, which were recorded by Davey as having 5–8 branches. Of 36 hairs examined, 14 (38·9 per cent.) had 5 branches, 19 (52·8 per cent.) 4 branches and 3 (8·3 per cent.) 3 branches. Mattingly (1944) noted specimens of *A. flavicosta* larvae from Kaduna with 3 branches.

Pupa

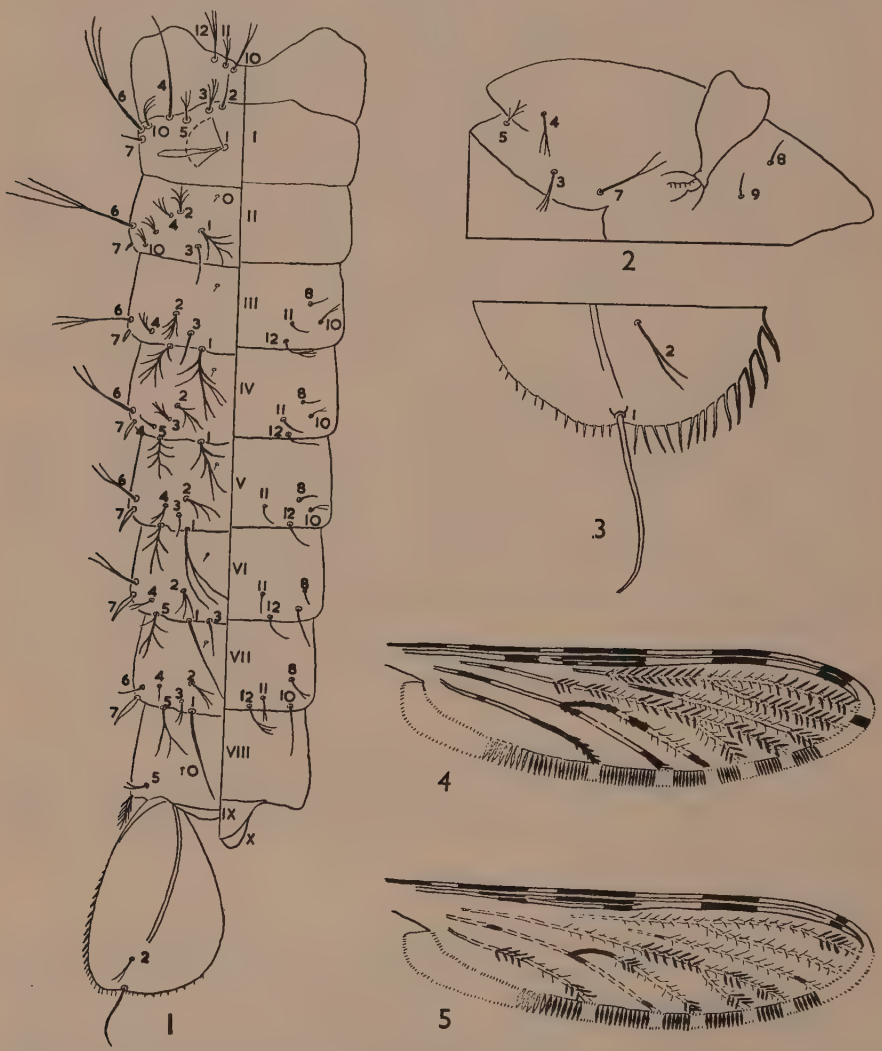
The pupa of *A. flavicosta* was described by Mattingly (1949). Since this description was, however, based on a single specimen from Makurdi, a description based on ten Kaduna specimens is included for possible later comparison with other populations. The only apparent difference between the Makurdi and Kaduna specimens is in hair 1 on VII (seta C), which is bifid in the former and unbranched in the latter. The branching of the other hairs falls within the

[1] Flood plain in wide river valley (North Guinea Savannah Zone) (Keay, 1949, *An outline of Nigerian vegetation*, Lagos).

range found in the Kaduna specimens. The nomenclature used below for the chaetotaxy is that of Belkin (1953). The figures following the hair numbers are the 70 per cent. mode, the mean number of branches and the range of branching.

Cephalothorax lightly pigmented, median keel and hooks absent. Trumpet without ribs, moderately pigmented, total length 0·4 mm., stem 0·08 mm.

Hair 3 (2b ; 2·8 ; 2–4) ; 4 (3b ; 3·0 ; 2–4) ; 5 (4, 5b ; 4·3 ; 3–6) ; 7 (2b ; 2·1 ; 1–3) ; 8 (1b ; 1·1 ; 1–2) ; 9 (1b ; 1·3 ; 1–2) ; 10 (2b) ; 11 (3b ; 2·9 ; 2–3) ; 12 (3, 2b ; 2·5 ; 2–4).



FIGS. 1–5.—*Anopheles flavicosta* Edwards : (1) pupal abdomen, dorsal and ventral aspects, numbering of bristles after Belkin (1953) ; (2) cephalothorax ; (3) tip of paddle ; (4) wing of the more usual variant form found in Northern Nigeria (Kaduna specimen) ; (5) wing pattern resembling that of type form (Kaduna specimen).

Abdomen lightly pigmented, 2·6 mm.; paddle 0·6 mm., spine 7 on segment VII dark brown, sharply pointed and one-third length of segment VIII.

Segt. I. Hair 2 (1); 3 (4, 5b; 4·3; 3–7); 4 (1); 5 (4, 5b; 4·0; 3–5); 6 (3b; 3·2; 3–4); 7 (1); 10 (3b; 3·2; 3–4).

Segt. II. Hair 0 (1); 1 (7, 8b; 8·0; 6–10); 2(5, 6b; 5·4; 2–7); 3 (1); 4 (3, 4b; 3·6; 2–5); 5 (3, 4b; 3·7; 3–5); 6 (3b; 2·7; 2–4); 7 (1); 10 (3b; 3·2; 3–5).

Segt. III. Hair 0 (1); 1 (7, 6b; 7·0; 5–9); 2 (5, 6b; 5·0; 4–8); 3 (1b; 1·1; 1–2); 4 (3, 2b; 3·0; 2–5); 5 (7, 6, 5b; 7·0; 5–10); 6 (3b; 2·8; 2–4); 7 (1); 8 (1b; 1·3; 1–3); 10 (2, 3b; 2·3; 1–3); 11 (1b; 1·2; 1–2); 12 (3, 2b; 2·3; 1–3).

Segt. IV. Hair 0 (1); 1 (5b; 5·0; 3–6); 2 (4, 5b; 4·2; 3–6); 3 (4, 5b; 4·0; 3–5); 4 (1, 2; 1·7; 1–4); 5 (7, 6; 6·5; 5–8); 6 (2b; 2·3; 2–3); 7 (1); 8 (1); 10 (2b; 2·0; 1–3); 11 (1); 12 (1, 2b; 1·7; 1–3).

Segt. V. Hair 0 (1); 1 (3, 2b; 2·4; 1–3); 2 (3b; 3·2; 3–4); 3 (1, 2b; 1·4; 1–3); 4 (3, 2b; 2·7; 1–5); 5 (5, 6b; 5·1; 4–6); 6 (2b; 2·2; 1–3); 7 (1); 8 (1); 10 (2, 3, 1b; 2·4; 1–5); 11 (1); 12 (1, 2b; 1·5; 1–3).

Segt. VI. Hair 0 (1); 1 (1b; 1·4; 1–3); 2 (3b; 3·2; 3–4); 3 (1b; 1·3; 1–2); 4 (2, 1b; 1·6; 1–2); 5 (5, 4b; 4·6; 3–6); 6 (2, 1b; 1·7; 1–3); 7 (1); 8 (1); 10 (1b; 1·2; 1–3); 11 (1b; 1·2; 1–2); 12 (1, 2b; 1·8; 1–3).

Segt. VII. Hair 0 (1); 1 (1); 2 (3, 4b; 3·0; 1–4); 3 (2b; 2·1; 1–3); 4 (1, 2b; 1·3; 1–3); 5 (3, 4, 5b; 4·1; 3–6); 6 (1b; 1·1; 1–2); 7 (1); 8 (2, 1b; 2·0; 1–3); 10 (1b; 1·2; 1–2); 11 (2, 1b; 2·0; 1–3); 12 (3, 2b; 2·4; 1–3).

Segt. VIII. Hair 0 (1); 5 (2, 1b; 1·8; 1–3).

Paddle as figured; very lightly pigmented; fringe mainly of coarse spines with a fairly sharp transition to hairs towards apex; fringe continuing further than apical bristle but less than half-way to base on inner margin. Apical bristle hooked, over one-fourth length of paddle. Accessory paddle hair (2, 3b; 2·4; 1–4).

Adult Female

Head: typical *flavicosta* form; maxillary teeth 12–14; pharynx (fig. 6) with about 13 well developed rods and cones which are indistinguishable from those of the typical form; filaments of cones generally branched at apex, the degree of branching varying in different specimens; lateral teeth of pediment irregular and sharply pointed. *Palps:* with apical and subapical pale bands equal in size but their relative extent with the intervening dark band varying considerably, width of dark band varying from a half to considerably greater than that of a pale band. *Legs:* pale markings at tips of tibiae and first four tarsal joints varying considerably, some small and indistinct, others more prominent as in typical *flavicosta*. *Wings* (fig. 4): indistinguishable from those described for *moucheti*, pale areas of costa varying from yellow to pale cream. (The following description is based on nine males and six females.) Costa black at base and with four dark areas; an accessory sector spot present in second dark area (in three specimens the sector spot and accessory spot were continuous); dark areas on other veins distributed as follows: stem of second vein, several spots on stem of fourth vein and its branches largely dark, fifth vein with a dark spot at apex, at fork and at base and tips of its branches, sixth vein largely dark; fringe grey with a dark spot at apex of wing and with pale spots at ends of third to sixth veins.

In a few specimens the dark areas of the lower branch of vein 2 and the upper branch of 4 were divided into two, and in two specimens the apical dark spot was absent. The wings of three further females were examined and found to have no pale interruption between the second and third dark areas of the costa; in one of these two basal costal interruptions were present.

Male Terminalia

Phallosome (fig. 7); length 0·1 mm.; apical leaflet 0·04 mm.; number of leaflets on each side varying from 7–10; all except one or two being serrated, the apical ones conspicuously so, number and size of serrations varying considerably; a pair of small spines usually present just below leaflets; harpago (fig. 8): club 0·06 mm.; apical bristle approximately 0·08 mm.; accessory bristle 0·046 mm.

FIGS. 6–8.—*Anopheles flavicosta* Edwards: (6) pharyngeal teeth of variant form; (7) phallosome; (8) harpago.

Bionomics

A. flavicosta in Zaria province is apparently mainly exophilic; only on one occasion during February, 1958 were three specimens caught biting indoors between the hours of 10.0 p.m. and 2.0 a.m. In the course of routine mosquito surveys carried out between July, 1957 and December, 1958 over 700 native huts were sprayed with pyrethrum during the early morning; any insects "knocked down" were collected on sheets spread out beforehand. Typical *A. flavicosta* were never found in these collections, and the rare records of "*moucheti*" made before this study took place almost certainly refer to *flavicosta*.

A. flavicosta is very catholic in its choice of hosts, for it has been found to feed readily on man, goat and sheep; gorged females have also been found resting in a pig house and in horse stables. Three fed specimens obtained from poultry houses were found by precipitin tests to contain avian blood.

During February, 1958 night catches were made with human bait in the vicinity of a stable trap containing either a sheep or a goat. In the sheep trap one *A. flavicosta* was caught as compared with 1·6 caught per man during the three hour period, and at the goat trap seven as compared with ten per man. The numbers of *A. flavicosta* caught biting outdoors at human bait were, in December, 1957 and January, 1958 3, in February 0·8 per man hour, and in the following four months none.

On a number of occasions catches were made to ascertain the influence of light on the biting of mosquitoes. Two catching teams were used, about 100 yards from each other; the members were periodically changed to avoid any personal influence. One team was provided with a paraffin vapour lamp and was placed two or three yards from it, the other team remained in total darkness. No *A. flavicosta* were caught by the team working with the light, although eleven specimens were caught by the other team during 14 man-hours.

Discussion

From the description above it can be seen that adult *A. flavicosta* vary considerably in many characters. Of the atypical forms which were so abundant during the dry season, the females appear to possess all the characteristics ascribed to *A. moucheti*. The males may be identified only by the number of phallosome leaflets, those of *A. flavicosta* numbering seven or more per side. The serrations of the leaflets appear typical of *flavicosta*, but in unstained preparations they are difficult to see and may have been overlooked by Evans (1938), who records that they are " so far as can be seen without serrations ".

From the great morphological similarities it appears very probable that *A. flavicosta* and *A. moucheti* form a species complex with the only reliable diagnostic characters in the larva. While the writer has examined no *A. moucheti* var. *nigeriensis* Evans, at present known only from Southern Nigeria, Mr. P. F. Mattingly is of the opinion that this should also be included in the complex. Discussion with entomologists in Northern Nigeria has led the writer to doubt the occurrence of *A. moucheti* in the region, as identifications have been based on adults only.

Summary

1. Morphological variations in *A. flavicosta* Edwards from Kaduna are described and the possible relationship of this species with *A. moucheti* Evans is discussed

2. Notes are given as to the breeding sites and bionomics of *A. flavicosta*.

Acknowledgments

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A NEW GENUS AND SPECIES OF CECIDOMYIIDAE (DIPTERA) INFESTING MUSHROOMS

By I. J. Wyatt

(*Glasshouse Crops Research Institute, Littlehampton, Sussex*)

[Communicated by Dr. N. W. Hussey]

Some female specimens of an extraordinary gall midge have been successfully reared at Littlehampton from larvae infesting mushroom compost. The sample of compost was received in February, 1958, from Mr. E. V. Henry of Padstow, Cornwall, who reported that " the crop has been an almost complete failure." During the next few days the flies emerged from the compost and from larvae which pupated on agar cultures of mushroom. All the flies were females and, although a further sample of compost was received, it contained only *Heteropeza* larvae. The male is therefore unknown as yet.

Although otherwise closely resembling *Heteropeza* and other genera of the Heteropezinae, these specimens are peculiar in that they possess bifid claws (fig. 3) and a cross-vein (fig. 10). No other genus in this subfamily possesses either of these characters. The midges in question, however, do not bear comparison with any known genus of either of the other two subfamilies, the Lestremiinae and Cecidomyiinae, so it is considered advisable to describe them as belonging to a new genus and species, in spite of the fact that only females (and the immature stages) are as yet known.

Henria gen. n.

Eyes with extensions towards crown of head (fig. 7). Flagellar segments of female antenna with a ring-like sensorium distally, attached to segment only by slender threads (fig. 1). Palpi one segmented (fig. 7). Tarsi five segmented, second about three times as long as first and claws distinctly bifid (fig. 3). Wings with three long veins (excluding the costa), a short cross-vein uniting the first and second (fig. 10). Sclerotised spermathecae absent.

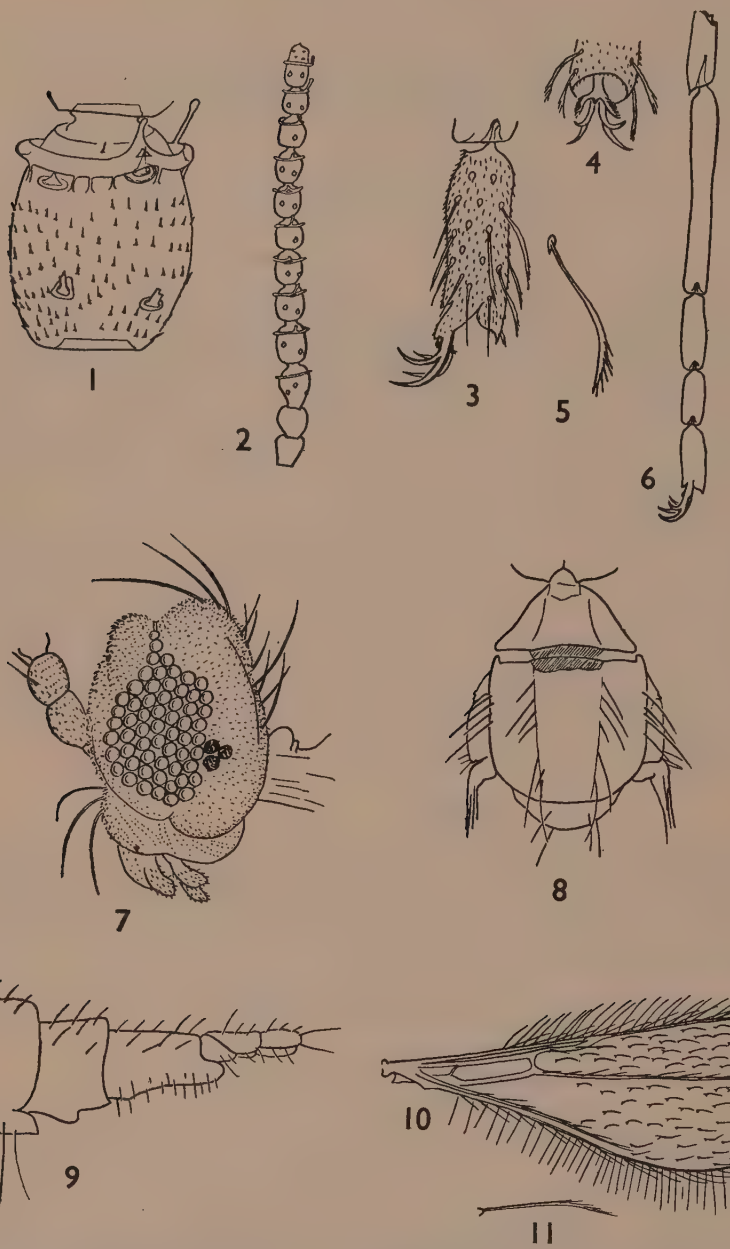
Type species: *Henria psalliotae* sp. n., by present designation.

Henria psalliotae sp. n.

Female

A minute pale midge with orange body contents; legs and wings invested with dark hairs.

Head: eyes with a triangular dorsal prolongation extending into a deep furrow across the crown but not forming a complete eye-bridge (fig. 7); a group of three or four pigment spots appearing to form a posterior lobe to the eye; head uniformly covered with microtrichia; six strong bristles on vertex projecting forwards, several post-vertical bristles and six frontal bristles; antennae about as long as thorax, with 2 + 10 segments, those of flagellum ovoid, rather longer than broad and diminishing in length distally except for the terminal segment, which is about twice as long as broad (fig. 2); each flagellar segment clothed with microtrichia; a ring of about six long hairs on proximal half and a few very short stout spines distally; a ring-like sensorium completely encircling distal end and attached to segment only by a number of short threads (fig. 1), the ring frequently forming a triangle



FIGS. 1–11.—*Henria psalliotae* sp. n. : (1) fourth flagellar segment showing ring sensorium ; (2) entire antenna ; (3) terminal tarsal segment showing bifid claws ; (4) apex of tarsus showing pulvilli and reduced empodium ; (5) tarsal hair ; (6) entire tarsus ; (7) lateral view of head ; (8) dorsal view of thorax ; (9) lateral view of apex of abdomen showing cerci ; (10) wing ; (11) hair from wing membrane.

around a spine where it passes over it, apex of triangle produced into a finger or club-shaped process; up to three of these processes on each segment whether the triangle present or not; palpi small, narrow, one-segmented and largely concealed behind a prominent labrum (fig. 7).

Legs: all about as long as wings, femur and tibia equal, tarsus somewhat shorter; tarsi five segmented, first, third and fifth segments about equal, second three times and fourth three-quarters as long as first (fig. 6); claws on all legs distinctly bifid (fig. 3), empodium reduced to a minute cone, pulvilli present, fringed, about a third as long as claws and concealed between them (fig. 4); legs entirely clothed in microtrichia and curved flattened hairs which are fringed distally along one edge (fig. 5). (This is best appreciated under phase contrast illumination.)

Wings: three times as long as broad, narrow basally and rounded at apex (fig. 10); following Frey's (1942) terminology (which appears to correspond with the venation found in this species), the wing has three simple long veins, radius running close to costa, and joining it before middle of wing; M_1 united to radius by a short broad cross-vein (presence of which is best appreciated in fresh specimens), then running straight towards apex of wing, though not reaching it; cubitus running parallel and close to hind margin for half its length but not uniting with it; entire margin fringed with three rows of long hairs, radial and medial veins, beyond cross-vein, and cubital vein with hairs; wing membrane uniformly clothed with microtrichia and, on distal two-thirds, with hairs resembling those on legs (fig. 11).

Thorax: each side with a row of dorso-central hairs, about four supra-alar hairs and a group of small hairs below wing base (fig. 8).

Abdomen: slender with scattered hairs and a row of four long hairs near posterior edge of sternum on segments two to seven; tenth segment reduced, cerci two jointed (fig. 9); apparently no sclerotised spermathecae.

Body length 1·5 mm., wing 1·1 mm.

England: Padstow, Cornwall, ii.1958 (*E. V. Henry*), 19 ♀ bred from larvae in mushroom compost at Glasshouse Crops Research Institute, Littlehampton, Sussex.

Holotype ♀ in collection of H. F. Barnes, Rothamsted, Herts. (Cecid. 12640.)

Paratypes: Three ♀ in collection of H. F. Barnes (Cecid. 12558–9 and 13673); 4 ♀ in collection at G.C.R.I., Littlehampton, with larval and pupal material.

Discussion

The systematic position of this genus is of considerable interest and worthy of some discussion. *Henria* can be excluded from the subfamily Lestremiinae without question, principally on its possession of a short metatarsus and a greatly reduced wing venation. Employing Felt's (1925) key to the world genera of Cecidomyiidae, it would also be excluded from the subfamily Heteropezinae (which are stated to have "cross-vein and circumfila wanting") and thus fall in the subfamily Cecidomyiinae (Itonidinae). However, no genus in the Cecidomyiinae bears enough real resemblance to *Henria* to suggest the inclusion of this new genus within the subfamily. The prominent feature of the Cecidomyiinae is the circumfila, and, although the ring sensoria of *Henria* might be considered to agree with the definition of these structures, they are perhaps best regarded as a possible link in the evolutionary development of circumfila.

In general appearance, in several anatomical details and in its biology,

Henria much more closely resembles the genera of the Heteropezinae. For instance, the wing venation, apart from the cross-vein, is very similar to that of all Heteropezine genera except *Heteropeza* Winnertz; the tarsal number and proportions resemble *Brittenia* Edwards, *Leptosyna* Kieffer and *Frirenia* Kieffer; single segmented palpi are found in *Leptosyna* and *Peromiastor* Kieffer; eye-bridges are found in *Brittenia* and the ring sensoria of *Henria* can be as easily homologized with the collar sensoria of *Brittenia* as with circumfila. These similarities, together with the exhibition of paedogenetic reproduction, make it more logical to include *Henria* in the subfamily Heteropezinae.

There remain several characters which appear to distinguish *Henria* from all the other known genera of the Heteropezinae. Outstanding among these are the cross-vein and the bifid claws, which are characters reliable enough to separate *Henria* from the other British genera, as keyed by Edwards (1941). All British genera have been examined and found to possess sclerotised spermathecae and to lack fringed hairs. The fact that spermathecae and fringed hairs have not been mentioned in descriptions of non-British genera does not imply their absence, however, for the former were never taken into account by early workers and the latter are only readily visible with modern phase contrast equipment. Thus a re-examination of the group is desirable with these earlier limitations in view, and the definition of the subfamily Heteropezinae must be modified to include *Henria*.

It is thought appropriate here to revise the recognised list of Cecidomyiidae known to infest cultivated mushrooms in Britain. The list as given by Barnes (1946) comprised *Mycophila speyeri* (Barnes), *Mycophila barnesi* Edwards, *Pezomyia vanderwulpi* (De Meij.), *Lestremia cinerea* Macq. and a *Miastor* sp. All except *Miastor* were first reared from mushroom beds by E. R. Speyer and reported by Barnes (1926), Edwards (1938), Speyer (1927) and Barnes (1946) respectively, *Miastor* being first reported by Barnes (1928). Later a *Heteropeza* sp. was added to the list by B. D. Moreton (1950).

Recently Hussey and Wyatt (1958) disputed the validity of the record of *Pezomyia vanderwulpi* and identified the *Heteropeza* sp. as *H. pygmaea* Winnertz. Doubt was also expressed concerning Barnes' record of *Miastor* and subsequent examination of the original larval material has confirmed that the species was more probably *Heteropeza*, certainly not *Miastor*. *Lestremia cinerea* was classed as occasionally attacking cultivated mushrooms out of doors but possibly not in mushroom houses. It should remain on the list, however, until more evidence is obtained. One additional species, *Mycophila fungicola* Felt (1911), occurs on cultivated mushrooms in the U.S.A. but has not been recorded in Britain.

The following simple key is given for the separation of the species of Cecidomyiidae actually known to infest cultivated mushrooms in Britain.

1 Wings with at most three simple veins, first tarsal segment shorter than second. HETEROPEZINAE . . . . . .
– Wings with at least four veins, one being branched, first tarsal segment longer than second. LESTREMIINAE 3
2 Wings with three veins and a cross-vein, five tarsal segments, no sclerotized spermathecae . . . . . **Henria psalliotae** sp. n.
– Wings with only two indistinct veins, two tarsal segments, sclerotized spermathecae present . . . . . **Heteropeza pygmaea** Winnertz

3 Medial vein forked, no sclerotized spermathecae
Lestremia cinerea Macquart
– Medial vein not forked, sclerotized spermathecae present 4
4 Empodium distinct . . . . . **Mycophila barnesi** Edwards
– Empodium rudimentary . . . . . **Mycophila speyeri** (Barnes)

All these species, with the exception of *Lestremia cinerea*, have been found to feed readily on laboratory cultures of mushroom mycelium and reproduce by paedogenesis. Comparative studies of the biology and morphology of the paedogenetic larvae are at present in progress at the Glasshouse Crops Research Institute, Littlehampton.

Summary

A new genus *Henria*, in the Cecidomyiidae, is described and its affinities discussed. The larvae of the type-species, *H. psalliotae* sp. n., are paedogenetic and attack cultivated mushroom beds. The list of mushroom-infesting Cecidomyiidae in Britain is accordingly revised and a simple key provided.

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A LIST OF THE MECOPTERA OF SOUTHERN RHODESIA, WITH THE DESCRIPTION OF A NEW SPECIES AND KEY

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This paper is based mainly on a study of the Mecoptera in the collections of the National Museum, Bulawayo, and the Entomological Branch, Salisbury, Southern Rhodesia. The terminology used is that of Tjeder (1956).

Bittacus woodi sp. n.

Bittacus montanus Wood, 1933 : 517, fig. 7 (*nec* Weele, 1909 : 21, fig. 4).

Holotype Male

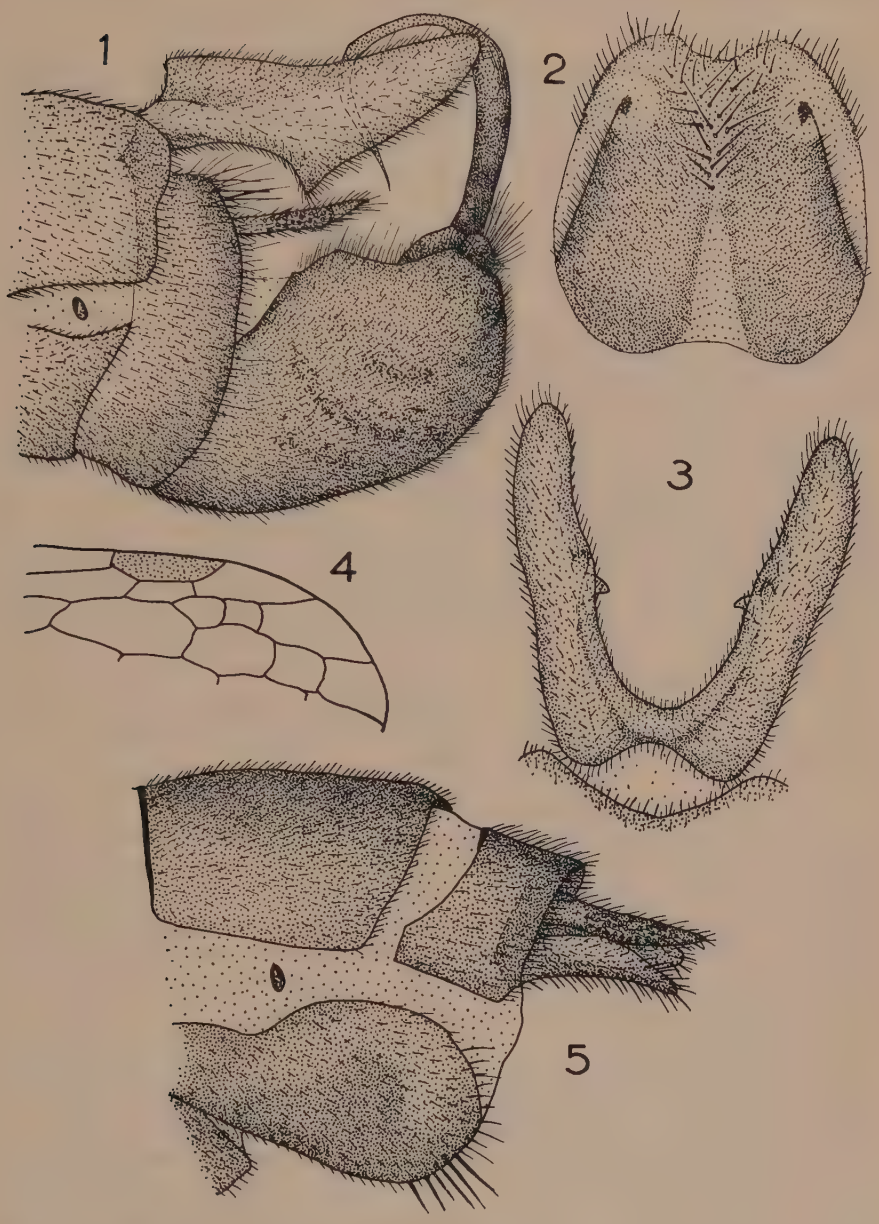
Coloration : generally yellowish-brown with the following parts darker : apex and lateral edges of rostrum, tarsi, palps, antennae and apices of femora and tibiae ; ocellar area and eyes black ; wings transparent, tinged faintly brownish, the tinting slightly darker in the area of the pterostigma and adjacent to vein R_5 ; veins dark brown.

Morphology : length of body 20 mm. ; fore wing 20 mm. ; hind wing 18 mm. Wing venation similar to that of *B. montanus* Weele ; pterostigma as in figure 4. Stout bristles present near base on fore and hind margins of both pairs of wings. Abdominal segments 2 and 3 with a few lateral bristles. Eighth tergite with a narrow antecosta, sclerotised only as a median elongated spot ; hind margin of tergite emarginate to accommodate base of epiandrium. Eighth sternite about three-quarters length of eighth tergite. Epiandrium in lateral view (fig. 1) broad, the upper and lower margins almost parallel in basal half as far as the well developed ventral tooth ; then converging to the rounded apex ; the large ventral tooth directed ventrally and inwardly. Basad of the middle, upper margin of epiandrium distinctly ridged. Seen from above, arms of epiandrium (fig. 3) not broadened beyond middle and anterior margin distinctly sinuate opposite emargination of eighth tergite. Ninth sternite only slightly shouldered at upper posterior margin, where it is strongly setose. Gonocoxites (fig. 1) rounded, upper margin, seen in lateral view, sinuate and distinctly shouldered at area of attachment of stylus. Stylus with long, fine hairs. Supra-anale and subanale of approximately equal length, the latter with a slightly curved tip, strongly setose. Cerci reaching beyond apex of ventral epiandrial tooth. Penis with a short penisfilum.

Allotype Female

Coloration : similar to, but generally a little darker than holotype, wing membrane slightly darker ; veins dark brown.

Morphology : length of body about 20 mm. ; fore wing 22 mm. ; hind wing 20 mm. Short bristles present on fore and hind margins in both pairs of wings, near base. Some bristles present on lateral margins of abdominal segments 2 and 3. Eighth tergite with a strong transverse antecosta. Ninth tergite with antecosta less well developed. Tenth tergite narrow dorsally, narrowing further laterally. Supra-anale and subanale equal in length and strongly setose. Cerci about as long as supra-anale. Subgenitale broad in lateral view (fig. 5), spiny posteroventrally. In ventral view (fig. 2), the subgenitale broad with a strongly emarginate anterior margin and a sinuate posterior margin, the spinose



FIGS. 1–5.—*Bittacus woodi* sp. n.: (1) male terminalia, lateral view; (2) female subgenitale, ventral view; (3) male epiandrium, dorsal view; (4) pterostigma and adjacent area of fore wing of male; (5) female terminalia, lateral view.

area lying between apex of emargination and posterior border. Integument near emargination less well sclerotised than rest of subgenitale.

Paratype Male

General coloration variable, in some cases lighter, and in others darker, than holotype ; extent of slightly darker parts of wing membrane also variable, especially so in area adjacent to R_5 and wing apex ; some specimens with veins a little lighter than in holotype. (These variations in colour may well be due to the age of the specimens.) Fore wing lengths of male paratypes as follows :

From Salisbury : 20 mm., 20·5 mm., 21 mm. (1 specimen each), 22 mm. (3 specimens).

From Urungwe : 20 mm. (3 specimens).

Paratype Females

Above observations, concerning colour variation in males, apply also to females. Fore wing lengths for female paratypes as follows :

From Salisbury : 20 mm. (3 specimens, including the Eastlea specimen), 21 mm., 21·5 mm. (1 specimen each).

Material studied.—Southern Rhodesia : 1 ♂ (holotype), Zwipani, Urungwe Reserve, 12.xii.57 (*R. Goodier*) ; 1 ♀ (allotype), Light Trap, Salisbury, December, 1956 ; 1 ♂, Zwipani, Urungwe Reserve, 24.xi 57 (*R. Goodier*) ; 1 ♂, same data, 5.xii.57 ; 1 ♂, same data, 16.xii.57 ; 2 ♂, light trap, Salisbury, 25.i.57 ; 2 ♀, 1 ♂, same data, January, 1957 ; 1 ♂, same data, 18.i.56 ; 1 ♂, same data, 3.ii.56 ; 1 ♂, same data, 2.ii 57 ; 1 ♀, Eastlea, Salisbury, 28.xii.57 (*C. N. Smithers*) ; 1 ♀, light trap, Salisbury, December, 1956 ; 1 ♀, same data, December, 1955.

Distribution of material.—The holotype and allotype will be deposited in the British Museum (Nat. Hist.) ; paratypes will be deposited in the collections of the National Museum, Bulawayo, of the Entomological Branch, Salisbury, and of Dr. Bo Tjeder, Sweden.

The only species with which *Bittacus woodi* might be confused is *B. montanus* Weele. The two species differ in the form of the epiandrium and the shape of the pterostigma. The epiandrium of *B. woodi*, when seen in lateral view, is relatively broader at the base and tapers relatively more towards the apex than in *B. montanus*. The ventral epiandrial tooth is stouter and better developed in *B. woodi*. When seen in dorsal view, the basal emargination of the epiandrium is considerable, whereas in *B. montanus* the equivalent border of the epiandrium is hardly sinuate.

The present material agrees well with the figure given by Wood (1933) for specimens which he considered to be *B. montanus*. It would seem, however, that his placing of his specimens under that name is not correct and that they were representatives of the species here described. It does seem possible that Wood was dealing with mixed material and that the above remarks may apply only to his Salisbury specimen ; his Uganda material may have been *B. montanus*, the type locality of which is Kilimanjaro. Kimmins (1957) mentions specimens of a " variety " of *B. montanus* from " S. E. Katanga, N. Rhodesia and Tanganyika " ; these may possibly be conspecific with the specimens described above as *B. woodi*. Undoubted records of *B. montanus* Weele have not, therefore, yet been obtained from Southern Rhodesia, and Tjeder (1956) was correct in accepting Wood's records with reserve.

It is interesting to note that *B. woodi* is frequently attracted to light; Tjeder (1956) mentions that only three species of the order are known to be strongly positively phototropic.

Bittacus weelei Esben-Petersen

Material studied.—Southern Rhodesia: 1 ♂, 1 ♀, Zwipani, Urungwe Reserve, 12.xii.57 (*R. Goodier*); 1 ♂, same locality, 17.xii.57 (*R. Goodier*).

Specimens in collection of Entomological Branch, Salisbury.

Bittacus armatus Tjeder

Material studied.—Southern Rhodesia: 1 ♂, Hope Fountain, 9.i.22 (*N. Jones*); 1 ♂, same locality, 27.xii.22 (*N. Jones*).

Specimens in the National Museum, Bulawayo.

One specimen is slightly darker and larger than the other, the fore wing measurements being 24 mm. and 22 mm. The epiandria of these two males agree with the original description (Tjeder, 1956) but the ventral tooth is rather more conspicuous when viewed laterally than the original illustration would suggest. The relative prominence of this tooth, however, may be influenced by the duration of potash treatment of the specimen. The present specimens are also a little longer in the wing than the type series, but they agree well in the shape of the pterostigma and in the leg pattern. It is interesting to note that the present specimens were collected within a short time of the allotype female, and at the same locality.

List of Mecoptera Known from Southern Rhodesia

All species of the order so far recorded from Southern Rhodesia belong to the genus *Bittacus* Latreille. These are:

(1) *Bittacus armatus* Tjeder, 1956 : 360, figs. 19, 34–46.

The only known Southern Rhodesian locality is Hope Fountain.

(2) *Bittacus testaceus* Klug, 1836 : 98.

It is doubtful whether this species should be included in a Rhodesian list. Tjeder (1956) has shown that specimens of several species have in the past been referred to in the literature as *B. testaceus* and indicates that the South African species referred to by Esben-Petersen (1913) as *B. testaceus* is, in fact, too small to be conspecific with *B. testaceus* Klug. Wood (1933) re-examined and figured a specimen determined by Esben-Petersen as *B. testaceus* from Barberton, Transvaal, and he included with it, under the same name, another male from Insiza, Southern Rhodesia. The true identity of the Insiza specimen is, therefore, uncertain and the matter cannot be investigated further until the Insiza male can be examined once again or a fresh series of specimens obtained from that locality.

(3) *Bittacus weelei* Esben-Petersen, 1913 : 142.

The specimens mentioned above, from Zwipani, are the only ones so far collected in Southern Rhodesia.

(4) *Bittacus woodi* sp. n.

This species has previously been confused with *B. montanus* Weele. Salisbury is the only known locality.

Key to the Three Species of *Bittacus* Known with Certainty to Occur in Southern Rhodesia

1 Colour brown ; large size, fore wing length 24–30 mm. ; initial forking of *Rs* with arms diverging almost at right angles **weelei** Esben-Petersen

– Colour pale brown or yellowish-brown ; smaller size, fore wing length 18–22 mm. ; initial forking of *Rs* with arms less divergent, an acute angle between them 2

2 Wings with faint brownish tinge, a little darker adjacent to R_5 in fore wing ; male epiandrium not extending beyond gonocoxites, epiandrial arms without internal apical spines ; female subgenitale posteriorly emarginate in ventral view, body of subgenitale spinose **woodi** sp. n.

– Wings with faint brownish tinge, evenly distributed ; male epiandrium extending beyond gonocoxites ; epiandrial arms with at least one internal apical spine ; female subgenitale not greatly emarginate posteriorly in ventral view ; subgenitale spinose along posterior margin . . . . . **armatus** Tjeder

Summary

The Mecoptera so far known to occur in Southern Rhodesia all belong to the genus *Bittacus* Latreille. One species, *B. woodi*, is here described as new and a key to the three identifiable species from Southern Rhodesia is given. One specimen previously recorded in the literature cannot be identified with certainty.

Acknowledgments

I would like to thank Dr. Bo Tjeder for comparing my drawings with type material of *B. weelei* and some of my specimens with type material of *B. montanus*, and for allowing me to draw extensively on his knowledge of the Mecoptera. I would also like to thank the Director of the National Museum, Bulawayo, for allowing access to the Museum collections, Mr. R. Goodier for donating specimens and my wife for assistance with the illustrations to this paper.

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Addendum

Pages 135–154
Peters, W. *Mosquitoes of New Guinea* (*Diptera : Culicidae*) *Part II.*
Page 154, Table 1, column 4, *Tox* = *Toxorhynchites*; *C.* = *Culex*; *H.* = *Tripteroides*; the *T.* of line 12 = *Tripteroides* (not *Toxorhynchites*).—[Ed.].